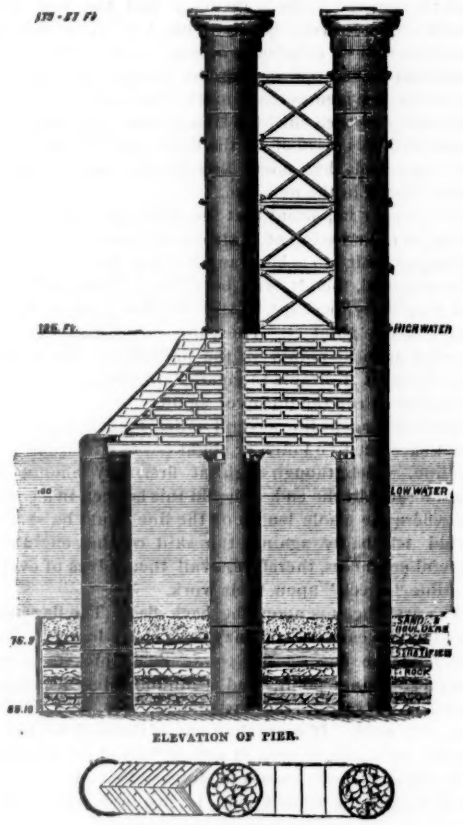
RAILROAD GAZETTE

SATURDAY, JUNE 24, 1871.

THE PNEUMATIC PILE FOUNDATION.

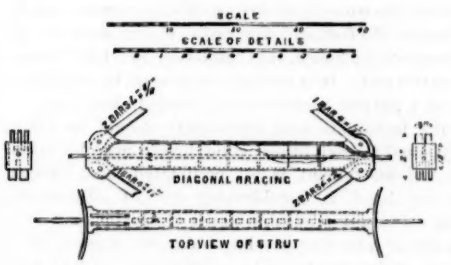
This class of bridge foundation, now brought for the first time in direct competition, on a large scale, with the older form of heavier stone piers, by the building of a high bridge resting upon pneumatic piles at Leavenworth, Kansas, merits attention from the fact that the popular mind seems somewhat prejudiced against what appears from a mere inspection of plans as a too slight support to resist the now well-known destroying power of our Western rivers. Believing, as we do, that the cast-iron pneumatic pile possesses, when properly constructed, a resisting strength equal to that offered by the dead weight and friction of the stone masses composing a masonry pier, besides possessing many advantages due to its ease of management and comparative cheapness, we give an illustration of pier No. 1 of the Leavenworth Bridge and some facts and investigations relative to its stability.

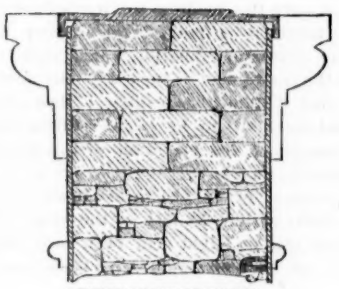


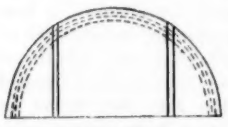
ELEVATION OF PIER.

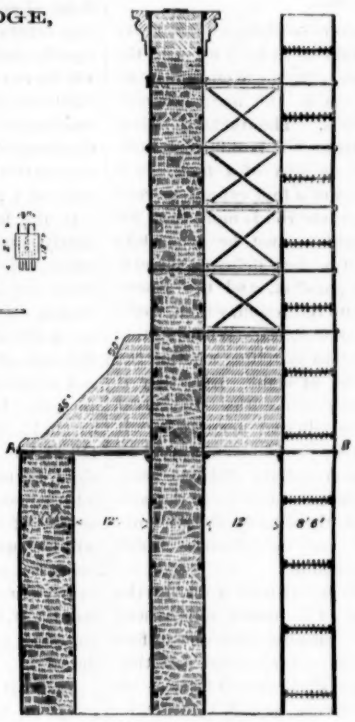
SECTION AT HIGH-WATER MARK.

THE MISSOURI RIVER BRIDGE,
Leavenworth, Kansas.
PIER No. 1.




SECTION OF TOP OF COLUMN.

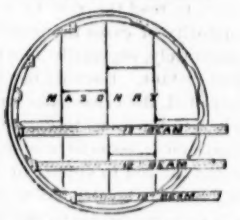

HALF PLAN OF CAP.



SECTION OF PIER.

SECTION AT *A B*.

SECTION OF ICE BREAKER.



PLAN OF ICE BREAKER.

Vertical section of one 10-feet Section of pneumatic pile.

Thickness of metal to high-water mark, 1⅛".

Thickness to Bridge seat, 1¼".

Horizontal half-section of pile.

Although a casual examination of engineering structures will not always convey a correct impression of their stability, or lack of it, we think that few persons, after a careful inspection of one of these piers as they now stand breasting the waters of the turbulent Missouri, would feel any doubt of the strength of those massive iron tubes to resist even the enormous pressure that an ice gorge may sometime bring against them. This evidence of the senses would of course prove nothing to such as are inclined to doubt their stability on the ground of their slender base—their comparative strength above the water line hardly admitting of question. We can offer no bett r argument than a direct analysis based upon the greatest force that ice can exert upon the two columns supporting the superstructure, according to the data obtained and used at Kansas City by Mr. O. Chanute, as given in his report on the bridge at that point. He fixes the maximum thickness of sound ice at one foot, and the greatest pressure that it can exert at 450 lbs. per square inch—this being the pressure necessary to "crush to atoms" sound ice, as determined by experiments on the works there. We will show that the "moment" due to weight alone is sufficient to resist this.

The pier given above is so bound together that it can sustain its own weight if suspended. We have, therefore, an *effective* weight equal to the entire weight of and load upon the pier, supposing them simply resting upon a smooth, hard bottom, exposed to a force acting in the plane passing through their centers, and considering only the two supporting columns. In order to overturn these two columns, the total weight of the columns themselves, together with the weight of the superstructure resting upon them, must be raised at the extremity of a lever arm equal to one-half the resting base measured in the direction of the disturbing force.

The entire weight of the two columns and the masonry and superstructure resting upon them is over 2,100,000 lbs., and the base on the line of the current is 29 feet. One-half this base multiplied by the whole weight will equal the moment of resistance of the pier due to weight alone, *i. e.* $\frac{29}{2} \times 2{,}100{,}000 = 30{,}450{,}000$.

Taking the extreme width of the column at nine feet, and the depth, over which the maximum pressure is exerted, at one foot, we have nine square feet, equal to 1,296 square inches, subject to the pressure, as given by Mr. Chaunte, the resultant of which will equal $1{,}296 \times 450 = 583{,}200$ lbs.

This force will act at the extremity of a lever arm, in the present case, of fifty feet. Therefore our overturning moment will equal $583{,}200 \times 50 = 29{,}160{,}000$, which is *less* than the moment of resistance due to weight alone for the two supporting piers only, as shown above. Also, the ratio of the thrust to the weight is less than the coefficient of friction, for stone upon stone (the proof of stability given by Chanute) being less than 0.3

We have thus far paid no attention to the third pile supporting the ice breaker, the total transverse strength of which is available to resist the disturbing force, and the additional weight of masonry supported upon it directly increases the moment due to weight only, and tends to increase it by bringing the center of gravity of the mass farther from the point of rotation, in increasing the lever arm. The force that we have thus far opposed to it is far in excess of what might be considered as the maximum thrust due to an ice gorge, as the form of the ice breaker is such that a cake or field of any size would be split long before the pressure reached the point assigned, and in splitting would be raised, giving a vertical component that adds to the resisting force, and diminishes the direct thrust proportionally.

Thus we have in the two supporting columns alone a resisting strength greater than any possible displacing force, and the additional strength afforded by the third pile and ice-breaker as a large coefficient of safety to compensate for over-looked defects of construction. Comparing with a pier of solid masonry, we have, instead of a non-adhesive mass of stone whose strength at any horizontal element is determined by the weight of the mass above that point independent of the part below, a mass of sufficient tensile strength to bring the weight of the entire mass into direct resistance, and whose attachment to the rock-bed is such that three iron columns, filled with concrete, must be broken before the pier can be displaced.

But so firmly are these piers fastened in the rock-bed that, in order to disturb one of them, it must be broken off at the point where it enters the rock, giving a very large additional element of strength, equal to the actual strength of three cast-iron tubes, to resist a force tending to break them simultaneously by a direct transverse strain. Some idea may be formed of the strength due to this condition, from the accidental test that the first tube was subjected to. Just after its final resting-place in the rock-bed had been reached, and only the bottom *plug* of concrete placed in it, a heavy dredge-boat broke from its anchorage some distance above, and swept down with the full force of the current (then near its maximum) broadside upon the single unsupported tube, which stopped instantly the motion of the boat, and held it broadside to the current until ropes could be brought ashore to pull it off. This severe test produced no perceptible disturbance or deflection of the tube, which must have resisted the shock and pressure entirely by its strength as a post fastened in the rock, as the moment due to weight on so short a base would be trifling when compared to the weight of the boat, multiplied by its velocity, equaling its moment of impact.

In the engraving of the pier it will be noticed that the weight of the superstructure rests entirely upon the masonry, which for ten feet below is composed of regularly laid cut stone, so the iron tube serves only as a casing to the concrete filling, thus avoiding the effects due to expansion and contraction in the iron, and giving a much larger area of bearing surface; it would be impossible to rest the cap *permanently* on both masonry and tube. An additional improvement was introduced by the Engineer-in-Chief for passing the rods through both columns and fastening by a nut and washer on the outside, instead of fastening to cast lugs bolted on the facing segments. An arrangements which substitutes compressive for tensile strain on the cast-iron shell.

Two bridges resting on this class of foundations have been built by Latrobe, and two by Bollman, the latter on the Cape Fear River, in North Carolina. The American Bridge Company, of Chicago, has established extensive works for the manufacturing of the sections composing these piles, and propose making a speciality of that form of foundation, the Leavenworth and Omaha bridges being the first built by them. The difference of one million dollars made in the bid on the St. Joseph bridge, shows the diffe ence in cost as compared to stone work, and the refusal to consider the bid based upon iron piers for the bridge shows how far the public as well as skilled engineers are prejudiced against them—a prejudice, as we have shown above, hardly well founded, and which seems quite similar to the opposition that the present popular iron superstructures met some years since, arising mainly because it looked too light as compared with the clumsy wooden structures then in favor.

The cut given above is sufficiently complete to ex-

plain itself. It shows the channel pier for a high bridge of three spans, 320, 344, 340 feet, crossing the river directly opposite Fort Leavenworth. It was begun under contract with L. B. Boomer & Co., and completed by the American Bridge Company after the consolidation which formed that company. W. W. Wright, Chief Engineer of the Kansas & Missouri Bridge Company, of Leavenworth, furnished the specifications, and the work has been completed under his direct supervision. On or before the completion of the work we hope to give a complete view of the whole structure and a detailed account of the progress of the work.

Contributions.

A METHOD OF CONDUCTING A RAILROAD SURVEY IN A NEW, WOODED COUNTRY.

BY JAMES D. BURR.

[Continued from page 131.]

We now come to that part of the operation to which all others are, in a measure, secondary, viz:

LEVELING.

As the survey, from the nature of things, is a hasty one, the leveler will find it difficult to keep up with the compass party if he attempts extreme accuracy in all cases; but unless the levels are, in the main, correct, they would be almost worthless. The turning points must therefore be carefully taken. It is sufficient, however, to read the rod to hundredths of a foot. In a majority of cases thousandths of a foot cannot be read accurately, especially so when the rod is more than 200 feet distant. For this the bubble must be accurately adjusted, the cross-hairs must be very delicate, the eye-piece in the focus to destroy parallax, and the atmosphere clear, so as to produce no refraction, which would cause the rod to appear to dance about. When all this is done, the leveler has no means of telling whether the rod is *perpendicular* to the line of sight. Evidently it requires great care to read the thousandths. In a great many cases the rod is not graduated accurately. It seems like a mere waste of time to read so minutely on railroad surveys. At the intermediate stations readings to tenths of a foot is generally as near as the surface of the ground will admit, there being always more or less rubbish, little mounds and irregularities which ought not to enter into the account.

The best style of rod, perhaps, for field work in the woods, is one 10½ feet long, 1½ inches square and painted *white*. The numbers denoting divisions of feet should be large and of a *red* color; those denoting tenths, *black*. An intermediate division (.05 feet) is all that is necessary for preliminaries, and if a target be used with a *vernier*, the vernier should be graduated so that a tenth of a foot would be divided into ten equal parts, which will admit of the rod being read to hundredths. In a majority of cases, if the leveler have a good glass, he can read the rod himself accurately to hundredths, at a distance of 400 feet from the instrument, thus obviating the necessity of setting the target at every turning point.

The advantages of such a rod over the New York, or Gurley rod, are these: The divisions on the Gurley rod are so faint that it cannot be read by the leveler at a distance of 200 feet from the instrument, with the best telescopes. It is thus necessary to set the target at every station, as well as at the turning points, and much delay ensues. Again, should the line of sight come above the 6½ feet of the Gurley rod, there is much delay in setting the target at the zero point and then sliding the rod to the required height, which, in wet or damp weather even, is no easy matter, owing to the expansion of the parts of the rod; whereas, with the rod 10½ feet long, there is no occasion to slide the rod, and the reading is taken at once. Moreover, the leveler can readily tell whether the line of sight comes *too high* for the rod, and, when such is the case, soon sets up in another place.

From considerable experience with both kinds of rods, I am led to conclude that with the simple rod, as I have described it, a leveler can do *one-third more work*, and just as satisfactory, than with the New York or Boston rod.

In crossing deep ravines it will generally be found expeditious, if practicable, to get the height or elevation of a point across the ravine before taking the levels in the ravine. But little care need then be taken in getting the levels *in the ravine*, for the elevation of the point thrown across the ravine is afterwards resumed. If there is simply a deep gorge and no wide intervening valley, it will be convenient, many times, to cut a long, straight pole, with suitable hacks or marks left on it by which the leveler will be able to recognize a point at which the horizontal wire cuts the pole, and the pole can then be measured by the level-rod or tape-line.

It is important that the exact reading of the rod should be given the leveler by the rod-man, when the target is used. It is usual for the rod-man to carry a "check-level book," in which he enters the readings at the several turning points, and, carrying out the several heights, he compares these with similar heights made out by the leveler every time he passes him. If they do not agree, there is an error either in the data or in the computation. It is more expeditious for the rod-man to call out to the leveler the reading, which, being repeated by the leveler, and understood the same by the rod-man, insures against mistakes.

BENCH MARKS

on preliminary lines should be taken at least every 3,000 feet, and, for convenience, take them in the line, as, in all probability, the located line will not follow the preliminary, and the elevations on the two lines will not agree. Much time is lost in seeking for suitable trees outside of the line, from fifty to one hundred feet, and much delay ensues in clearing out the line of sight.

Care should be taken to make the distance of the sight ahead equal that taken backward; for, without this, errors in the adjustment of the instrument will be rapidly multiplied. Errors introduced by refraction will be too slight to be taken into the account; for, in 1,700 feet, the correction for earth's curvature and refraction, is .059 feet, and the ratio of curvature to refraction is 14.2; hence, the refraction for 1,700 feet—about 0.003 feet. It is scarcely necessary to say that a sight of 1,700 feet would ever be taken in leveling.

If the foresights and backsights should be taken nearly equal to each other, good levels may be taken when the instrument is not collimated, and, indeed, when the level is considerably out of adjustment, though it is not advisable to use an instrument very much out of adjustment. For example, suppose in a distance of 400 feet there is a collimation of 0.10 feet, and suppose it to make the reading too much by this amount. Let the height of a point before known to be 110.12, then the error of collimation would make it 110.22, but when the instrument is turned to the foresight, taken 400 feet distant, the reading is then also 0.10 *too* much, and, as this is to be *subtracted* from the height of the instrument, the elevation of this point will be found correctly, and, as this angle is very small, being but a "departure" of .10 feet in 400, it will give nearly correct results within 20 feet of the required point. If, however, the foresight had been only 200 feet long, an error of .05 feet would have been introduced.

An error may be introduced by adjusting the level. Suppose, in the example taken above, a bench had been made near the instrument, and then the level had been adjusted. In starting the line from the elevation of the bench mark, an error of nearly a tenth of a foot will be introduced. The rule then would be, when known errors of calculation have existed, and the instrument is adjusted between any backsight and foresight, to add or substract the error from the height of instrument before taking the foresight after the instrument has been adjusted. Or, if after the level has been adjusted any other point of starting be taken, except that where the errors are destroyed by distance, other errors will be introduced.

If the level is in *perfect adjustment* it is not advisable to take sights over 500 feet either way from the instrument, for in such a long distance a slight movement of the bubble will cause an appreciable error. The motto on preliminary survey is: "Be correct, but not too precise." Never mind the hairs which may get under the level rod, but be careful there are no large sticks.

An example of the two extremes might be cited. I have seen a man at the level at least five minutes trying to get the elevation to a point not 50 feet distant, in perfectly calm weather and with his instrument standing firmly on the street. On the other hand, an engineer (?), in running a line of levels, between Saginaw and Port Huron found the surface of the lake at the latter point *sixty feet higher* than the surface of water in Saginaw River at Saginaw. The explanation of it is, perhaps, that he considered *swamps level*, or he must have guessed at the elevation of many points. In leveling across swamps more than ordinary care must be taken. An arithmetical mean of a good many readings will give the most probable value of the reading, supposing equal care to have been taken in all.

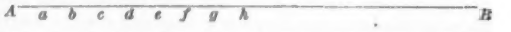
Sounding rods must be taken along by the party when numerous swamps occur, for they are sometimes very deep and long. I have seen, on a Northern Michigan railroad, swamps of loose muck from 10 to 50 feet deep, which could not be made to support a roadway under any circumstances, unless by piling. Even deeper and longer than this one have been found in Michigan. These must be avoided when practicable.

After the preliminary line has been completed, and the most favorable ground selected, the engineer is thoroughly prepared to commence the work of

THE LOCATION.

While everything has been done in a hasty and apparently careless manner on the preliminiary surveys—though really quite accurately done—on the location everything must be done with *care* and *precision*.

Suppose that it is desirable to locate as near as possible on the line *A. B.*



Suppose the line also four or five miles long. Then, having been run in different parts of the same day, it cannot be presumed that it is a straight line or that it has the same bearing throughout. Moreover, there must be little offsets in setting up behind trees. The theory of errors—that they occur on one side as often as on the other—does not apply to a limited or small number of times, so that if we should set up the transit at *A*, and take a foresight of three or four-hundred feet in the direction of *B*, to *a* for instance, we could hardly expect to come out at the point *B*, or that the new line would coincide very nearly with *A B*. Therefore it would be well to commence at some point, *c*, say a half mile from *A*, and, setting up the transit temporarily, direct the axe-men to clear out the line each way, say a half mile, and then shift the transit until a line is found which will be a *mean* of all the little errors in the compass line, and thus much increase the probability of preserving *B* in the new line.

If it is very important that the point *B* be preserved, owing to the crossing of a stream, a "gap" in a ridge or the proximity to a lake, and it is not important that *A* be retained, then it will be found a saving of time and perplexity, perhaps, to start the line from *B*, as directed at the point *A*. The rule is: "Commence the location at those points on the preliminary line which it is the most desirable to retain," otherwise it may be necessary to run the line over again.

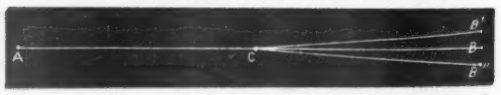
When a tangent line several miles long is to be run, great care must be taken or slight *crooks* will appear in the line, which, though slight at first, may amount to considerable in the end. Should this happen in a country where the whole length of the line could be *seen*, it would tell badly against the skill of the engineer. Careful engineers, therefore, avail themselves of every possible "check" upon their work.

The first check is upon the back flag. The flag-man may become careless and lazy, as his is a lazy job, and not hold the flag *on the point*. Small pickets set up at every "change-point," and at suitable intervals, either ahead of or behind the instrument, will be a check upon the work. If more than one of these pickets at a change-point can be seen at a time, behind the vertical wire, there is much reason to suppose that the line is straight, and the transit man is inspired with confidence.

Another, and the most important check, is upon the instrument itself. An instrument may be put in never so delicate adjustment, but there is no security that it will be so an hour afterward. Besides, it is impossible to adjust an instrument *perfectly*. In a hot day, the transit being left exposed to the sun, the wires gradually work out of the focus, coming back again towards evening. This is owing to the unequal expansion of the metal of which the tube and diaphragm are composed. It is evident that this can only be remedied temporarily; for if the instrument is reversed, exposing the other side to the influence of the sun, the wires will be drawn back again and the instrument will be as badly out of adjustment as ever.

A good line can be run, however, when the line of collimation is not in the focus, supposing the error to be constant during an observation.

Still another check is the method of double centers:



Let *C* be the place of the instrument, and *A* the back flag, and let it be required to find a point *B*, in the line *A C* produced, when there are collimation errors.

Drive at *B* a hub of sufficient size, having a smooth head, and find a point on it as *B'*; reverse the instrument by the lower movement to *a* and find another point *B''*. A point midway between *B'* and *B''* will be in the line *A C*. To check the work, use *B* as a backsight and *A* for foresight. If *B* has been correctly found, it is evident that in making two observations on *A*, in one of which the lower movement has been reversed, the cross wires ought to come equally on each side of *A*. If this is not the case, it is fair to presume that the point *B* has

not been correctly found, and the process must be repeated until the work is sufficiently exact. Of course it is not to be presumed that the instrument "throws off" more than two inches in a quarter of a mile.

Short backsights and foresights should be avoided when possible, as the liability to error is thereby much increased.

The stations should be ranged in with the transit, and short plugs, from 8 inches to 18 inches long, and from 2 inches to 3 inches in diameter, should be driven even with the surface of the ground for the station distances. The station stake should be driven in line and about a foot distant from the plug. The plugs will preserve the line should the stakes be destroyed, in clearing. They are also very convenient when the slope-stakes are to be set for the construction parties.

In running out curves it is not necessary that the point of intersection of the tangents should be found with extreme care. As an example, let the angle of intersection $I = 10°, 20'$, and by error let $I = 10°, 20', 40''$. Let Radius ($2°$ curve), $R = 2{,}864.93$ feet. Required T and T' and length of curve, $L\,C$ and $L'\,C'$. We find that $T' = 275.96$ feet; $T = 275.66$ feet; difference $= 0.30$ feet; $(L'\,C') = 517.21$ feet; $L\,C = 516.66$ feet, and the difference $= 0.55$ feet.

It is evident that T and T' might be so disposed on the ground that T being less than T', $L'\,C'$ would coincide nearly with $L\,C$.

TRANSIT-BOOK.

The same remarks apply to the manner of k·eping the field notes in this as in the compass-book. The bearing of the line should always be taken for convenience in platting; and, should any difference be observed between the bearings given by the compass and that given by the transit, it should be noted, as it may be desired to plat that both the preliminary and the located lines should be on the same map.

Lines should always be platted by bearings, and it is especially desirable when the lines are long and there are numerous curves to be run in. It is very convenient to sketch the curves in the field-book when they are run out in the field. The computations made should also be entered, as it will save much time when the curves are to be platted.

It is very convenient in practice, when deflection for fractional parts of a hundred feet are to be made, first to set the vernier with the proper deflection, and turn on the backsight by the lower movement, then, by bringing the vernier to zero, the proper deflection is made, after which the deflections for a $2°$ curve will be single degrees for $1°$ curves, $3'$, etc. By this process we avoid much confusion and the deflections can be rapidly made. As a matter of convenience, the degree of the curve is taken as argument, for if length of tangent was taken it might involve too much time to make the proper deflection.

The levels should be taken with much care on the locating survey, the readings being taken on the several plugs to hundredths of a foot, and between stations when there is a sudden change in the surface.

Bench marks should be made frequently, say every quarter of a mile, and always at the crossings of streams. They must be taken from 50 to 100 feet from the line. Benches made on the preliminary survey should be used to check those on the located line whenever convenient.

It will be observed that we have not assumed cases of more than ordinary difficulty. When such exist it is not possible to lay down any prescribed mode of operation. The emergency should be met by the requisite skill in the engineer.

ASSOCIATIONS OF ENGINEERS.

[An address read at the second annual meeting of the Civil Engineers' Club of the Northwest, at Chicago, June 12, 1871, by Charles Paine, President. Printed by order of the club.]

GENTLEMEN: In most societies like ours, the custom has obtained of requiring from the President an annual address, I suppose in acknowledgement of or payment for the honor conferred by this election. Profoundly sensible of the dignity of his position, and penetrated by a sincere thankfulness for the kindly feelings which bestowed it upon me, I have wished for some means of making an adequate return; and believing that in more skillful hands the address from the Chair might be made the occasion of much usefulness or entertainment, I have ventured to inaugurate what I hope may prove a long series of annual addresses before the Civil Engineers' Club of the Northwest.

That this club shall attain to the influence to which it is entitled by the character and talents of its members and the value of the profession which it represents, will continue to be, for me, an object of steady effort; for I am of those who believe that our calling need yield precedence to no other, if rank is to be measured by usefulness.

To administer Nature's code of laws, converting her powers to the service of man, is the business of the engineer, and constitutes his the science of civilization. The students of the natural sciences and of the mathmatics are his pioneers; they gather and prepare for him stores of facts and of formulæ out of which he is to construct a fabric for the advantage of his kind; and it is by means of such practical adaptations of the discoveries of science to his service, that the primeval man, who went naked, was sheltered in caves, worshipped an animal, has become the tenant of palaces, attired in vestments of luxury, kneeling in groined cathedrals before the altar of the true God. I would not willingly depreciate the share which the teachers of spiritual truths have had in this work, nor fail in ample acknowledgement of the elevating influences of art and literature; but it is demonstrable that a scaffolding of material benefit must always be erected before the more perfect moral structure can be usefully begun.

To every member of our profession this reflection that he is aiding the progress of his race, and, however feebly, is really contributing to bring nearer the "good time coming," should prove a support when he might otherwise be oppressed by those discouragments which all must encounter. Yet we do not lack more immediate reasons for cheerfulness, among which may be named the increased appreciation by others of the importance of the engineering profession, evidenced by the more frequent employment and better pay of instructed men; by the more liberal endowment of schools for scientific education; by the increase of valuable textbooks and records of experience, and by the great improvement in the character of technical journals.

The difficulties attending the early American or British engineers, who set out with a purpose to qualify themselves for their special duties, were only surmounted by that perseverance and energy which enabled those giants, afterwards, to overcome great physical obstacles; indeed, it is not very long since no more than a thin smattering of the sciences could be obtained at schools, unless sandwiched between huge slices of at Greek and Latin classics.

Now, this is changed; numerous schools of science open their doors, in this and in every other civilized country, offering to the neophyte every aid to the attainment of the most lofty reaches of the human mind; and so vigorous is the reaction that even the older seats of classical learning seem to vie with each other in remodelling their curricula, and in reversing the older order, giving to belles-lettres their appropriate place as the ornament of real knowledge.

In the next generation of engineers there will be no room, nor any excuse for those not well learned in the sciences.

The supreme importance of accurate knowledge in all departments of engineering has led, in most of the countries of Europe, to the establishment, by their governments, of academies for the education of men especially for this profession; while, in several of those countries, only such as have received the diploma of the national academy may adopt the title or practice the calling of civil engineer. This arrangement has there proved of some advantage to society, as well as to the profession itself, as a protection against pretenders, so that in England, and even here, there are many persons who are anxious that some such safeguard shall be provided where it does not now exist. It seems to me, however, that this advantage to which I have referred has caused the greater benefits of our present freedom to be overlooked. Schools may qualify and perfect, but they do not create the engineer, nor can they teach that practical acquaintance with things and with modes of work which is indispensable to him, and which may go far towards compensating for a want of scientific acquirements. It should be remembered that some of the most eminent names upon our scroll are those of men whose native illumination surpassed anything the doctors of science could have imparted to them; and that many of them never could have passed any collegiate or governmental examination whatever, if that had been necessary to the exercise of the profession which they adorned. I would urge, too, against the wish for an authorized, diploma-equipped body, that the exactions of practice and the good sense of society will not leave to pretenders any wide field; that capital is not often entrusted in large sums to incompetent men; and that since diplomas have not suceeeded in excluding hypocrites from the pulpit, nor quacks from the bedside of the sick, nor pettifoggers from before the courts of law, we cannot expect a parchment to prevent incompetency from appearing as an engineer. Yet we do need very much here some organization which shall establish engineering as a profession; which shall absorb into its reputation the glory of the individual achievements of its members, as the professions of law, medicine and divinity have done; so that, like those professions, ours may have a literature, a science, and an acknowledged value of its own, distinct from all others.

At present the success of any great engineering work is attributed altogether to the ability and genius of its author; he is the smart man who has originated all the wonderful means to attain to his more wonderful end. It is not known by what gradual steps this height has been ascended; how it was the labor of generations of patient experimenters which gathered all the facts and data from which the really able, but by no means wonder-working, man was furnished for his undertaking. He was a great engineer because he acquired and skilfully employed the learning and experience of previous engineers, probably adding thereto; but the glory of his work is to the profession.

How, then, shall we accomplish this result of bestowing upon the individual the reputation of a man accomplished in engineering, and of taking up for the profession, the credit of all his accomplishments? Some certificate must issue from some authorized body; the question is, how shall that body be constituted? For myself, I think the best diploma is that which is conferred by societies of engineers; where a man's right to his title is based upon his performances and upon the judgment of his peers. In Great Britain, the Institution of Civil Engineers, now embracing nearly 2,000 members, of all grades, is a more jealous guardian of the dignity of our calling than any governmental or academic supervision could become. Such an institution, rich, flourishing and influential, our profession needs here, and the need was felt by many of our abler men, long ago, resulting in 1852 in the formation of a Society of Civil Engineers, intended to be national; but, like all other national institutions, it almost fell to pieces during the rebellion. Since the restoration of peace this American Society has been revived, and now invites the co-operation of those interested in the objects for the promotion of which it was formed. Many of you are doubtless informed of its history, several are already members of the association; but for those less familiar with the facts I will state a few particulars concerning its present condition, and the mode of entering into its fellowship:

The society numbered, at the date of its last catalogue, 208 members, scattered among the different States of North America, with Alfred W. Craven for President, and Alfred P. Boller for Secretary. Its headquarters are at No. 63 William street, New York, where meetings are held on the first and third Wednesday afternoons of each month. A collection of models and a library of engineering have been commenced; twenty-eight papers which have been read at these meetings, are printed in the Transactions of the Society; many of them are of much value.

The provisions of the Constitution with regard to membership are as follows:

ARTICLE XVI. The active members of this society shall be divided into two classes, to be styled respectively *Members* and *Associates*, and each person when duly elected and qualified shall receive a certificate of membership, indicative of the particular branch of engineering or of science which he represents. *Associates* shall possess all the rights and privileges of *Members*, excepting the right of voting.

ARTICLE XVII. To be eligible as a member, the candidate must have been in the actual practice of his profession for at least seven years, and have been in charge of work or of operations in his particular branch of engineering or of science. A diploma from any collegiate institution in good standing, conferring the degree of C. E., shall be considered equivalent to two year's service.

ARTICLE XVIII. To be eligible as an *Associate*, the candidate must have been in the actual practice of his profession for at least two years.

ARTICLE XIX. Any candidate for membership, either as *Member* or *Associate*, must be proposed by at least two *Members* of the society, at a regular meeting thereof; and each proposition, together with the names of the proposers, must be posted in some conspicuous place in the rooms of the society, for at least thirty days before being submitted to vote.

ARTICLE XX. Any person thus nominated who shall receive by ballot the votes of two-thirds of those present at any regular meeting shall be considered duly elected, unless three ballots are cast in the negative. Members not voting shall be held to have cast their votes in the affirmative or for the candidate.

It is further provided that persons thus elected shall be cla·sified as resident or non-resident members or associates, those who live within 50 miles of the city of New York being classed as *residents*; the annual dues of non-residents being now fixed at $10, and for residents $20.

The by-laws provide that all candidates for admission to the Society must file statements, made either by themselves or those who propose them, setting forth the grounds of their claim to be elected.

The national society having now become estabiished, it rests with the engineers of America to make it a means of improvement and a power; and I think that every member of the profession, entitled by his acquirements to become a candidate, should at once pre-

sent himself for election. Let the worthy join hands, and we may feel sure that the unworthy will be excluded from their circle.

While dwelling at such length upon the importance of a national society, I do not under-estimate the advantages and benefits derived from local associations, like this Club, which are quite as necessary to ourselves as the national one, although not of such consequence to the profession at large. To members who have been present at our meetings during the past winter, it is not necessary to recall, more fully than the Secretary has done, by his careful record of the subjects which have come before us, the great number of interesting facts communicated in the papers which have been read, and during the informal discussions which followed them, in order to convince them that these monthly sessions have been of real value to them, as engineers. Of how much greater worth, even, they have proven socially! bringing together men of various occupations, who would otherwise rarely meet; exhibiting them in the pleasant lights of the drawing-room, rather than that of the office; developing sympathy with and a friendly interest in each other's pursuits; kindling the love of one's calling by each new achievement reported; uniting us into a band of hearty friends, ready always to exchange opinions, or to give advice or information to whoso stands in need, whenever we can.

Unceasingly engaged in the details of business, the members of our profession are likely to have time for study of only the particular department of engineering in which they are employed, while it is most important to their development that they should have free and frequent intercourse with workers in all the other branches, so that they may know what progress is making by them, and also learn how questions, which may be under discussion, apppear when viewed from all sides.

And now, while I am engaged upon the topic of our own Club, I shall take the privilege conceded to the writers of farewell addresses since that of the first President of the United States had such a success, of giving some advice to the assembled members.

Firstly, then, my hearers, let me warn you against the sin of non-attendance. There is probably no gentleman present who thinks it of much consequence, to any one but himself, whether he comes to the meetings or not; but it is of great consequence to the success of the Club; it is complimentary to the essayist, necessary to a full discussion, and stimulating to the other members.

Secondly, bring with you all you have got and let it out; above all, do not limit your contributions to the one paper demanded from each in his alphabetical turn. If you have had a new experience, or made a new discovery, here is the place to reveal it; if you have made a mistake and been taught a useful lesson in consequence, here is the place to make a full confession; if you have been engaged upon any calculations of general interest, let us have the result; if you have got together statistics or formulæ which were widely scattered, give in the benefit of your toil; if you have kept an account of the cost of any particular work, give us the figures as you have summed them up for yourself. These things will make our Club a real helper to each member, and, not impoverishing any, make us all rich indeed.

In congratulating you upon the increase in the number of our members, I venture to suggest that the Club is now strong enough to hire a convenient place of meeting, and to recommend that the Executive Committee be instructed to provide a room for our meetings, at least as soon as the resumption of sessions after the summer vacation. I recommend, also, that our meetings, after that time, shall be fornightly instead of monthly. We proceed, now, at so slow a rate in the demand upon members for their regular contributions, that many of us must expect to disappear from the scene before the end of the alphabet is reached; and I feel sure that many of the gentlemen whose names begin with yet distant letters are impatient for a more rapid motion towards their places in the orbit.

Some of our more sanguine members believe that we might already begin the formation of a professional library, which would unquestionably be of very great service to us, and to all engineers in the Northwest who may be pursuing any special studies; yet I would hesitate to propose any such effort until we become more numerous and more convinced of the advantages of co-operation than we now are. We are all so busy, studying so little and ploughing along so industriously in the everyday drudgery of work, that, although at times a good library would be worth almost its cost to a single member of the Club, yet, on the whole, it would probably suffer from neglect. There is, however, a means by which we could enjoy many of the advantages of a library without much cost. The Chicago Library Association already has upon its shelves a considerable number of volumes of engineering interest—reckoning among these the works treating of the arts, sciences and manufactures, about two hundred—besides fifty volumes of technical publications, such as the London *Builder*, *The Engineer*, *Engineering*, etc., which are unbound and therefore unserviceable; also, bound and arranged in order, a complete series of the British Patent Reports. This Club might make a very profitable investment of what it can spare from its income, if the constitutional dues were to be collected, by having these periodicals bound and put upon the shelves of the Library, so as to be convenient for reference. And if any expensive work, of value to all the members, were to be procured from our funds, it would be accessible to all of us in that library, and to others, to whom any private library belonging to the Club would not be. We could also easily arrange to have the books belonging to the Club marked and made returnable to the Club upon demand. Books of the class which we would be likely to buy are, by the rules of the Library, not permitted to be taken out, so that we might be sure of their safety.

These several recommendations are made with deference, but with a hope that they will receive consideration because of the sincere interest in the prosperity of the Club which has prompted them.

It was my intention, before I found that I should take up too much of your time with what I have already spoken, to review the progress of engineering during the past few years, by a somewhat descriptive account of the great works which have been executed in that period, this having been customary in annual addresses. But I have found such services so admirably done in the engineering journals, that it were better to read to you from their pages than to undertake any original labor of the kind. Yet I cannot forbear to speak of the emotions excited by the lecture of these reviews, while they display the grandeur of past successes and lead to the contemplation of yet more daring schemes as possible and even probable:

The agency which seems to me to have had the most important influence upon the present and future condition of the human race of any of the engineering labors of this century, is the improvement in the means of communication between the different parts of the earth, now increasing so rapidly and universally that even the daily newspapers cannot keep us informed of their extension and multiplication. Railways already traverse the continents from side to side, and are connected by steamships from coast to coast. The completion of the Suez Canal certainly foretells the construction of one across the American isthmus, when we shall have lessened by one-half the distance around the world, for those who go in ships. This year will extend the telegraph to every civilized or even half-civilized kindred, tongue or nation, uniting all men in an instant sympathy; a longer step towards the universal brotherhood, I think, than the dreaming Red Commune of Paris.

It was difficult to feel much concern for the welfare of people whose happiness or misfortune was a half-year old when first heard of, and which would be overcome and forgotten before our aid could reach them; but when the morning paper says the other side of the world is on fire, or stricken by a pestilence, or threatened by famine, your help is needed *one*, the answer is immediate, and a credit for means to purchase what is needed goes by a return flash over the wire which told of the distress.

Looking at what our art has done in Holland, in India, and elsewhere to make the earth sweet and habitable which was once pestilential or submerged; when we read the statistics which prove how sensibly the death rate has been reduced, even in Great Britain, in our own times; while we think upon the admirable triumph of sanitary engineering of which this city is the scene, can we not surely anticipate the time when, through our labors, everywhere "the wilderness and the solitary place shall be glad, and the desert shall rejoice and blossom as the rose."

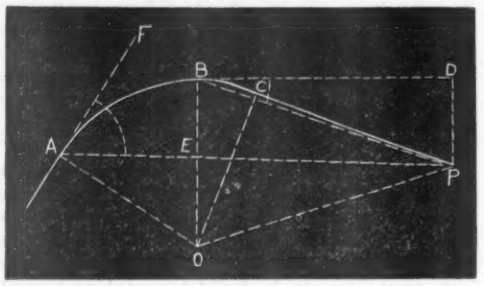
So far we have wrought with the grosser powers of Nature, only dimly perceiving the existence of forces which, we feel sure, must, when they are understood, be even more serviceable to man than the others have become; such are gravitation, magnetic attraction, electricity, galvanism, the heat and light of the sun, the strength of the tides, the buoyancy and currents of the air, chemical actions in combination, crystallization and dissolution. But we know that the sappers and miners, whose patience is inexhaustible, and whose succession is without end, are at work, and will conquer their secrets. Thousands are watching the dip of the needle; others observe the phenomena of the air, or experiment upon the constitution and changes of matter, with instruments continually improved in delicacy; and they hourly announce to us new laws and modes of force.

If we purpose to be as faithful to our duty as the students of the sciences are to theirs, and thoroughly to perform the task which we have assumed of translating into daily usefulness the abstract theories and new discoveries with which their researches enrich our knowledge, we have no light task to perform, and may well band together, as they have done, for each other's assistance.

Singly we shall in vain strive to keep pace with the advance of science; but, with that strength which comes from union, we may hope to render valuable service to the community in which we reside, the foremost desire of the virtuous citizen and of the civil engineer.

Laying out Railroad Curves.

Mr. H. W. Lewis sends us from St. Joseph, Mo., the following statement and solution of a practical problem in laying out railroad curves:



From any point A, on a curve of radius R, to continue the curve until its tangent shall pass through a visible unknown point P.

Measure the angle $F\ A\ P$. Continue the curve $\frac{\text{angle } F\ A\ P}{\text{degree of curve}}$ stations to B, where its tangent will be parallel to $A\ P$. At B measure the angle $D\ B\ P$.

Then $B\ E = R\ (1 - \cos.\ F\ A\ P)$,

$$B\ D = \frac{B\ E}{\tan.\ D\ B\ P},$$ and

$$O\ E = R \cos.\ F\ A\ P.$$

But $$\frac{R \cos.\ F\ A\ P}{\sqrt{B\ D^2 + O\ E^2}} = \cos.\ P\ O\ B;$$ and

$$\frac{R}{\sqrt{B\ D^2 + O\ E^2}} = \cos.\ P\ O\ C.$$

$P\ O\ B - P\ O\ C = C\ O\ B$, and $\frac{\text{angle } C\ O\ B}{\text{degree of curve}} =$ number of stations from B to C, the end of the curve. $D\ P$ must be less than R.

—Sixty of the guests of Henry Meiggs, the great Peru railroad contractor, who were present at the opening of the road from Mollendo to Arequipa, have procured for him a magnificent silver epergne, of unique design, which weighs 800 ounces, and cost $5,000. The New York *Tribune* describes some of its ornaments as follows:

The side panels represent a locomotive passing through an archway, and a party of surveyors and engineers grouped about a tent, with the Arequipa Mountains in the background. In front of the rounded pedestals are figures of Peruvian laborers clad in *ponchos*, in characteristic attitudes; and on either side of the figures are shields inscribed with the names of the givers. Directly above the base are groups of acanthus foliage, and four terminal *amorinæ*, supporting an inverted truncated cone with an octagonal base. The four figures are caryatides, or half-figure Cupids. The center-piece is surrounded by eight flower-cups, lined with gold. Four of the octagonal faces are ornamented with delicate wreaths of foliage, and the remaining faces with groups of bows, quivers filled with arrows, and other native implements of warfare. The upper part of the cone is ornamented with four fasces and wreaths of laurel alternating with cornucopias filled with tropical flowers and fruits. The cone terminates in a circular disk, bearing in front a representation of the rising sun, the ancient symbol of Peru. The globe is surmounted by a statuette, 10 inches high, representing the Genius of Peru, holding in one hand the winged wheel of progress and in the other a ship's rudder, symbolical of judicial guidance.

—The stockholders of the Mississippi River Railroad Company met last week and elected the following directors: Messrs. John Overton, Jr., A. T. Lacey, Minor Merriwether, Frank White, P. E. Norton, C. H. Hill, T. Boyle, D. M. Hemming and S. R. Latta. Total number of votes cast, 7,016. Messrs. Hill, Boyle, Latta and P. E. Norton are new members of the board, they succeeding Messrs. E. Norton, S. P. Bernard, A. Harris and J. L. Norton.

—A railroad was opened on the 16th inst. between Stockholm and Christiana, the capitals respectively of Sweden and Norway. The distance is about 300 miles.

—Mr. M. Soutter succeeds Mr. J. B. Bond as General Ticket Agent of the Atlantic & Gulf Railroad Company.

AN ELASTIC TRACK.

The form of rail shown in the adjoined engraving has been devised in view of the great cost of railroad iron and the general desire and demand for a cheaper permanent way. The inventor has not allowed himself to be diverted, in seeking this end, by the idea that a decrease in the expense of permanent way can *only* be secured by a corresponding decrease in the gauge. Mr. Morgan claims, in accordance with the estimates given below, that by his system a track can be laid materially cheaper than with the old T rail supported only upon cross ties. And it is not alone in the first cost of the track that it is expected to diminish expense, as he claims that the uniform elasticity it will receive from its continuous timber support will, in all probability, cause it to outwear the common rails.

It will be seen, from an inspection of the engraving that the rail is of the ∩ pattern—not a novel idea in itself—but so improved as to do away with its imperfections. The rail may be made of steel or iron, as the character and amount of the traffic may demand, and its weight is estimated at about 58 per cent. of T rail for the same duty; that is, where a T rail of 60 lbs. per yard would be required, a ∩ rail, laid in this manner, of 35 lbs. would suffice. The inconveniences of the shrinking of rail-timbers will be neutralized by the wedge-like base of the rail, impelling it to a steady and equal bearing on the timbers.

It is proposed to have the rail timbers creosoted, and the iron fastened to them by special wood-screws passing through the flanges, and due allowance will be made for any kind of expansion or contraction.

The system is equally adaptable to any gauge or character of traffic. One of the advantages claimed is that its shape admits of perfect rolling while the unequal thicknesses of the T rail cause unequal cooling, and consequent partial disintegration of the fibres of the iron.

ESTIMATE OF COST OF TRACK WITH 60 LBS. T RAIL FOR ONE MILE.

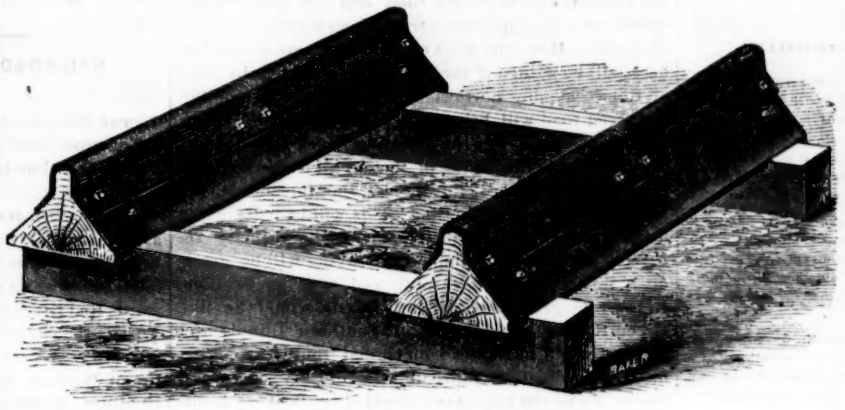
96 tons per mile of iron, at $65 per ton	$6,240 00
Fish-plates and bolts	245 00
3¼ ton spikes	243 75
2,640 ties at 65c each	1,716 00
Laying of track	500 00
Total cost	$8,944 75

ESTIMATE FOR SAME WITH MORGAN'S PATENT ELASTIC TRACK, IRON 35 LBS. PER YARD.

55 tons of iron at $65 per ton	$3,575 00
53,000 feet B'd m at $14	742 00
6¾ tons bolts or spikes	243 75
Extra joint-plates	50 00
2,000 pine or hemlock creosoted ties at 35c	700 00
Laying of track	700 00
Total cost	$6,010 75

Which shows a saving of about 33 per cent.

Mr. Geo. C. Morgan says he can furnish narrow-gauge track with his rail at a cost of about $4,000 per mile. His office is at Room 41, Reynold's Block, Chicago.



Morgan's Patent Elastic Track.

MECHANICS AND ENGINEERING.

Michigan Bridge and Construction Company.

This company has recently been organized for the purposes set forth in its title. They propose building steel suspension bridges, trestles, roofs, etc., and are also general contractors for building railroads. The offices and works are in Detroit, and the officers are Elijah Smith, President; Samuel Buel, Engineer, and Geo. B. Hill, Treasurer. The company is, we believe, the successor of the "Michigan Bolt & Nut Company."

The Detroit Bridge & Iron Works.

The works of the company occupy a large square, in Detroit, between 20th and 21st streets, near Michigan avenue. They make a specialty of building iron bridges of the form known as the Bollman truss, though they also build modern bridges of various patterns and do heavy forging and other iron work for other contractors. One of the peculiarities of their work is that all the links are welded under steam hammers, instead of being "upset." For heavy links they pile the scrap iron themselves. This work requires a large number of steam hammers, which are all of their own manufacture. The car-axles made here are hammered to as nearly as possible the required form before cutting, in order that, as nearly as possible, all the fibers may be longitudinal. The bridge links are all tested by an hydraulic tester to bear a strain of 20,000 pounds per square inch, and the maximum error allowed in their length is 1-32 of an inch.

The company have recently completed an iron bridge over the Miami River, at Defiance, Ohio, on the Toledo, Wabash & Western road. This bridge has four spans of 150 feet each and one span of 65 feet. Three bridges over the Mississippi River, at Burlington, Quincy and Hannibal, were made here, and, as was mentioned last week, they have taken the contract for building the Missouri River Bridge, at St. Joseph.

The works have a capacity for filling contracts to the extent of about one-million dollars a year, and can work five hundred hands, though they employ an average of only about two hundred. About five thousand tons of iron—one-fifth of it cast iron—it uses in a year, and the material of different kinds consumed costs about $450,000 a year.

The Bellcair Bridge.

The new bridge across the Ohio River at Bellcair, a few miles below Wheeling, was crossed for the first time by a locomotive on the 21st inst.

Remarkable Railroad Metals.

An article in the Montreal *Gazette*, discussing the value of steel rails in comparison with iron, says of the new rails ordered by the Grand Trunk Railway:

"The Managing Director of the Grand Trunk Railway of Canada has just received from England a set of samples of the material used in the rails, and to be used in the other departments, such as tires and axles, showing the way in which this steel can be twisted into all sorts of shapes without fracturing. These samples have, by the kindness of Mr. Patterson, been placed in one of the rooms of the Board of Trade for inspection, and are well worthy of examination. Especially to hardware and iron merchants are the samples of interest. Among them is an iron rail which was twisted, cold, thirteen times round before fracturing. This rail was selected at random from those made for the Grand Trunk Railway, and was subjected to this severe test in the presence of Mr. Potter, the President of the company. It is twisted into the shape of a spiral spring, and the fracture indicates that the metal retains its hardness, as well as its toughness and malleability. Then there is a piece cut from a plate of H. M. S. Devastation, and bent, cold, across the grain; flanges bent by hammering cold; double-headed steel rail bent cold; pieces bent cold and elongated 25 per cent.; and an axle bent cold in testing machine with a pressure of tons at 3 feet 6 inches bearings. This axle is bent into a complete knot, without any fracture whatever. Other samples all attest the wonderful durability of the metal, and afford evidence of its superiority, not simply for rails, but for the tires and axles of wheels of rolling stock."

Hannibal & St. Joseph Railroad Shops.

The shops of the Hannibal & St. Joseph Company, at Hannibal, Mo., are ranked among the best ordered and most efficient in the Western States. An idea of the amount of work done may be had from the fact that 570 men are kept employed in them. The wages paid to these men average $2.65 per day.

During the year past there have been completed at the car shops 6 sleeping cars, 12 passenger and baggage, 15 way and 189 freight cars—using during this time $812,000 worth of material.

All the car-wheels are set on the axles by hydraulic pressure, and in this work great care is used to have the pressure required accurately adjusted so that, on the one hand, there may be no danger of the wheels loosening, and, on the other, that the wheels may not be so strained on the axle as to cause liability to crack. No wheel is allowed to be set on the axle at a pressure outside of the limits of between 40 and 50 tons.

For bolt-heading, one of Lewis, Olliver & Smith's machines is used, and the steam hammer, which strikes a blow of 150,000 pounds, is of Bement & Dougherty's manufacture.

The Miller platform and coupling is used on all passenger trains and is highly approved here, as elsewhere, in the shops and along the line of the road. The Westinghouse brake has been adopted, but has not yet been applied to the cars and engines. It will in a short time be in service on all the passenger trains.

A Worthington duplex steam-pump supplies the shops with water and, in emergency, acts as a fire engine, drawing the water through a 6-inch pipe a distance, horizontally, of 700 feet, and, vertically, 20 feet.

An immense fan, requiring 5-horse power to drive it, *sucks* all the chips and shavings from the planing and molding machines and forces them through pipes around to the furnace. The apparatus has a capacity for transferring 50 bushels of shavings per hour from the machines to the fire, and is, altogether a neat, economical, time-saving and accident-preventing arrangement.

There are now building two Pullman cars, which will be completed in about two weeks, and will—as every Pullman car has done heretofore—excel all that have gone before in elegance and "modern improvements." There are also in course of construction 150 flat cars for the Burlington & Missouri River road, and two very elaborate pay cars, to cost $14,000. One of these is for the Kansas City, St. Joseph & Council Bluffs Railroad, and the other for the Hannibal & St. Joseph. They will be models, in their way, divided into compartments—a counting-room, two state-rooms and two drawing-rooms, with a porch or balcony at one end of the car. The safe in the counting-room is mounted on rubber springs, and all the interior wook work of the car is black and white walnut, with no gilding or metal ornaments appearing anywhere.

German Railroad Traffic During the War.

A correspondent of the London *Railway News* gives the following:

The official returns of the traffic and receipts of the German railways this year—made up to the end of April—are highly satisfactory, for thirty-six show an excess over the corresponding period of last year, which was long before the complications that led to the war, and only five show a falling off. Some of the former show an enormous increase—thus, the Rhenish with 591,600 thalers, the Berlin & Anahalt 205,482 thalers, and the Thuringian 257,971 thalers. Expressed in percentages, which is, after all, the safest and most conspicuous mode of making a comparison, the Gluckstadt & Elmshorn Railway shows an increase in their receipts of 103 per cent., the Rhine & Nahe 59 per cent., the Berlin & Stettin 28 per cent., the Halle & Cassell 67 per cent., the Gotha & Leinefeld 30 per cent., the Frankfort & Hanau 25 per cent., the Berlin & Gorlitz 19 per cent., the East of Prussia Southern Railway 15½ per cent., and several of 12 and 13 per cent. Of the five that exhibit a deficiency, the Cologne & Minden has a falling off of 140,145 thalers, equal to about 5 per cent., and the Cologne & Giessen 56,559 thalers, or about 8½ per cent.

According to the official returns for 1870 the Baden State railways show a falling off of the passenger traffic for that year, but an increase in the receipts for goods, so that on the whole they were nearly equal. The number of passengers conveyed over the lines isstated to be 5,343,680, who paid 3,717,927 florins, against 4,180,238 florins in 1869. On the other hand, there was a considerable augmentation of the goods traffic, including artillery, ammunition, provisions, and warlike stores for the use of the army in France, which brought up the total receipts of the year to 16,132,472 florins, against 15,924,793 florins in 1869.

Railroad Earnings for May and the First Five Months of 1871.

We take from the *Commercial and Financial Chronicle* the following:

RAILROAD EARNINGS IN MAY.

	1871.	1870.	*Increase.*	*Decrease.*
Chicago & Alton	$465,780	$408,685	$57 094	....
Central Pacific	917,760	768,719	149,041	....
Cl'v'l'd, Col., Cin. & Ind.	281,491	257,487	24,004	....
Illinois Central	691,445	684,538	10,907	....
Marietta & Cincinnati	119,6 0	110 213	9,437	....
Michigan Central	480,>47	406,283	74,564	....
Milwaukee & St. Paul	662,3?7	730,789	....	$68,422
Ohio & Mississippi	222,263	246,366	....	24,003
Pacific of Missouri	284,733	293,096	....	8,364
Toledo, Wabash & W'n	453,109	340,>92	112,117	....
Union Pacific	711,815	802,586	....	90,771
Total	$5,795,159	$5,049,454	$487,164	$191,460

For the first five months of the year railroad earnings generally compare favorably enough with last year, but there is no great increase in traffic and the earnings *per mile* on those roads which have added materially to their mileage. The receipts are in some cases not as large as in 1870. The general tendency of railroad earnings in this country is unquestionably towards a steady increase, but this increase must be gradual and cannot be expected to proceed by strides, nor to be shown every year without some intervening periods of decreased traffic. In the year 1869 railroads were generally prosperous, and increased their gross earnings considerably, but since that time there has been no uniform increase on the Western roads, and where heavy profits have been shown they have in most cases been the result of an economical administration and a large saving in operating expenses.

EARNINGS FROM JANUARY 1 TO JUNE 1.

	1871.	1870.	*Increase.*	*Decrease*
Central Pacific	$3,310,445	$1,693,(00	$617,355	....
Chicago & Alton	1,915,908	1,686,764	2 9,144	....
Clevl'd, Col., Cin. & Ind.	1,482,329	1, 78,204	254,125	....
Illinois Central	3,094,946	3,131,122	....	$36,216
Marietta & Cincinnati	635,670	5 6,290	129,380	....
Michigan Central	2,254,655	1,865,862	388,793	....
Milwaukee & St. Paul	2,247,953	2,329 916	....	81,963
Ohio & Mississippi	1,255,049	1,188,287	69,762	....
Pacific of Missouri	1,345,188	1,338,419	6,769	....
Toledo, Wabash & West'n	1,984,639	1,506,197	478,442	....
Union Pacific	2,619,752	3,051,462	....	401,710
Total	$22,126,494	$20,482,613	$2,163,770	$519,889

—The Court of Errors and Appeals for the State of Delaware has unanimously declared unconstitutional the tax of ten cents per head attempted to be levied by the Legislature of that State upon every passenger traveling by steam routes. The suit was brought by the State against the Philadelphia, Wilmington & Baltimore Railroad Company, for $75,000. The law is declared invalid only so far as it applies to passengers traveling into, out of, or wholly through the State—that is, so far as it attempts to impose a tax upon inter-State travel.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

	Page.		Page.
ILLUSTRATIONS.		EDITORIALS.	
The Pneumatic Piles of the Leavenworth Bridge	143	The Darien Canal	148
Railroad Curves	146	Grain Transportation on the Upper Mississippi	148
Morgan's Elastic Track	147	GENERAL RAILROAD NEWS.	
CONTRIBUTIONS.		Mechanics and Engineering	147
The Pneumatic Pile Foundation	143	Railroad Earnings for May and the First Five Months of 1871	147
Method of Conducting a Railroad Survey in a New, Wooded Country	144	Chicago Railroad News	149
Associations of Engineers	145	Traffic and Earnings	149
Laying out Railroad Curves	146	Old and New Roads	150
Railroad Movements in Texas	148	Elections and Appointments	151
EDITORIALS.		Master Car-Builders' Association	152
Russian Railroads as Affecting Northwestern Exports	148	SELECTIONS.	
The Car-Builders' Convention	148	German Railroad Traffic During the War	147
		The Slide-Valve—III	152

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary, the inventor is expected to furnish his own engravings, or to pay for them.*

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

***Engineering and Mechanics.**—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent.*

RUSSIAN RAILROADS AS AFFECTING NORTHWESTERN EXPORTS.

The great grain-exporting region of Europe, as is well known, is in Southwestern Russia, in the valleys of Dnieper and the Dniester, and the other tributaries of the Black Sea. Here grain is raised in abundance and at low cost, and the population is so light as to require but a small portion of the production for home consumption.

The chief grain-exporting port of this region is Odessa, near the northwestern corner of the Black Sea, which is to Russia what Chicago is to the United States. Odessa, however, unlike Chicago, ships its receipts of grain directly to the foreign market. Although on the map it appears comparatively near the great grain markets of Western Europe, it is practically more distant from them than is the Atlantic coast of the United States. The vessel, on its way from Odessa to Liverpool, first sails southward nearly 800 miles, and accomplishes more than two-thirds of the circuit of Europe before reaching its market, the distance being about 3,600 miles.

However, the grain of the Black Sea country has taken this route to a market because it has had no other outlet. The railroads, whose location has been determined by the government, have tended to confine the traffic to this route, as the only lines connecting the Black Sea country with the Baltic are very indirect and have their northern termini at St. Petersburg and Riga, which are further from England and the other grain markets than other Baltic ports which are nearer Odessa. But the Russian Government has adjusted its whole system of railroads so as to develop Russian ports, and special efforts seem to have been made to strengthen the cities on the Black Sea, a considerable system of railroads to ports on that sea having been designed and several of them completed.

But now we are informed that the Russian Government has authorized the construction of a comparatively short line from Brest-Litovsk to Lyk, a town on the Prussian frontier at the terminus of a railroad which leads to the port of Konigsberg. This line will at once connect by a very direct route the whole Black Sea system of railroads with this port of Konigsberg (on the southeastern part of the Baltic) and also with the system of Prussian railroads, placing Odessa within about 700 miles of Konigsberg, and not much more than 1,000 miles of Hamburg. Now, as the distance by sea to London from Konigsberg is only about 1,100 miles, and from Hamburg only 400, and as by this route the carriage by rail from the wheat fields to the Black Sea will be saved, it is reasonable to believe that the course of grain shipments from the Black Sea may be reversed, and the cost of transportation so reduced that it may become a more formidable competitor than ever to the grain-exporting States of the Northwest. Heretofore, we may say, the Black Sea wheat-grower has been situated like the farmer of New York—he has shipped his grain one, two, three or four hundred miles by rail and then 3,000 miles by sea to Liverpool. Hereafter, if this proposed railroad system is completed and effectively operated, he will be more like an Illinois farmer, so far as railroad transportation is concerned, who ships a thousand miles by rail to New York, while the Black Sea farmer's Liverpool will be only 400 miles from his New York. The Russian, having no more rail transportation than the Illinoisan, or, at most, the Minnesota wheat-grower, will have from 2,000 to 2,500 miles less transportation by sea to reach the English market.

It must not be taken for granted, however, that because the grain can be moved by this route where it is that it will be. The Russian Government may permit the construction of such a road and yet prohibit the diversion of so important a traffic from Russian to Prussian ports. However, most of the advantages of Konigsberg will be gained if the grain is forced to go by way of Riga, 200 miles northeast of Konigsberg, which the proposed road will bring much nearer to the Black Sea than it is by the existing lines. The object to be gained is the saving of the circuit from the Black Sea to Northwestern Europe by the Bosphorus, the Mediterranean and Gibralter. This will be effected by making any Baltic or North Sea port the primary receiving port for the grain, but the saving will be greatest if this port is as far south and west as possible. Riga as the grain port of South Russia would be like Green Bay as the grain port of Southern Illinois and Missouri; but in Russia commercial routes are often made subordinate to railroad and military considerations. To us the important question is: Will any modification of the Russian railroad system which will give an outlet on the Baltic for the grain of the Black Sea materially reduce the cost of marketing that grain, and therefore enable Russia to compete more closely in the foreign market with American producers?

The Darien Canal.

By the latest news from the Selfridge expedition we are coolly informed that the route from the Gulf of Darien to the Bay of San Miguel, which we were told a few months ago offered a route for a canal almost without difficulties, is impracticable, and that the most favorable route discovered is that from Cupica Bay to the Atrato by way of the Napipi, a route which has been explored with care heretofore by Trautwine, Kennish, and Michler.

So far, it would appear that the chief result of the last Darien expedition is the further demonstration of the great difficulties of constructing a canal there. Trautwine estimated the cost in 1852 at $325,000,000. Still this demonstration has its value. If it shall be finally demonstrated that a canal is impracticable across the Isthmus of Darien, the explorations should not, therefore, be discontinued, but only directed to other parts of Central America. The transcendent importance of the work justifies long-continued and costly investigation. The world will not rest until a channel for ships is cut across Central America.

Grain Transportation on the Upper Mississippi.

Very few have any idea of the vast amount of grain carried, chiefly from Minnesota landings, on the Mississippi River on its way to Chicago and Milwaukee. Several lines of steamboats and barges find their chief business at this time of year in carrying grain and flour from these landings to the railroads. Indeed, the largest part of the product of Minnesota has heretofore been carried on the Mississippi to La Crosse, Prairie du Chien, Dubuque and Fulton, there to be transferred to the Chicago & Northwestern, the Milwaukee & St. Paul, or the Illinois Central for transportation to Lake Michigan.

The Milwaukee & St. Paul alone has had a through line by rail to the lake, but the completion of the Northwestern's line between Winona and La Crosse has made a rail outlet to one more railroad hitherto entirely dependent on the river, and the West Wisconsin and the Baraboo Air Line will soon bring the railroads still more closely into competition with the steamers.

But this year a new diversion has been made on the river itself through the Lake Superior & Mississippi Railroad, which seeks to carry the wheat and flour of Minnesota to Duluth for lake shipment. It has now a line of steamers and barges which run between Winona and Stillwater, to which little town on the St. Croix River the Duluth road has a branch; and as the rail transportation by this route is only about 150 miles, in place of 400 or 500 to Lake Michigan, and the distance by lake from Duluth is about the same as from Chicago, it will readily be seen that it is able to make low rates: indeed, we are informed that there has been a reduction of the rate on flour from Winona to New York from $1.50 to $1.00, chiefly on account of the competition of the Duluth route.

A very large part of the river shipments from Minnesota and Wisconsin to Chicago are made by way of Fulton, by what is known as the "Diamond Jo" line, which runs between Fulton and St. Paul, and carries many millions of bushels of grain yearly.

The Car-Builders' Convention.

The detailed report of the annual convention of the Master Car-Builders' Association, which we give in this number of the RAILROAD GAZETTE owes much of its completeness to the reports in the various Richmond papers, which we have used freely in compiling our report.

RAILROAD MOVEMENTS IN TEXAS.

GALVESTON, Texas, July 9, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The promise of railroad activity in Texas is just now, for the first time in the history of the giant State, being really felt.

THE HOUSTON & TEXAS CENTRAL,

after many years of snail movement, progressing both before and since the war at the rate of about fifteen miles per year, is now pushing both its trunk lines towards Red River, and over its Western Branch towards Austin, the capital, at a rate likely to accomplish about fifty miles on each within the year 1871. On the Austin, or Western Branch, the cars are now running to Giddings, 55 miles this side (east) of Austin; and about seven miles of track are laid beyond, with track-laying at a rate this company has never exhibited before. The grading is rapidly progressing on every mile thence to Austin, and with the stimulus of a handsome premium for completion before January, 1871, offered by the people of Austin, it will be ready for the iron by August 1, and in the month of October the cars will run through to the capital of Texas, 220 miles from Galveston.

Nothing we have ever seen in Texas is more picturesque than the white tents strewed along the entire line, across the limitless prairies that open beyond the timber of the Yegua, and extend to the very suburbs of the city. In fact, these prairies sweep away to the northward with such a realm of verdure and fertility as to invite the settler and the cultivator with resistless persuasion whenever he trusts his eye to a glance upon them. At Austin, the

INTERNATIONAL

(whose line sweeps down from the northeast corner of the State, precisely on the prolongation of the Cairo & Fulton line) crosses the Colorado at the foot of our Lilliputian mountains, and points forward to Palafox, on the Rio Grande, and San Blas on the Pacific. The surveys have been carried to this point, and are now making haste for San Antonio, the historic city of Texas. I have been over their line, nearly entire, before their advent, and recently have visited their place of commencing work at Hearne, on the Central Trunk line, 170 miles from Galveston, and found more than 2,000 laborers strung along their route for a distance of nearly 100 miles. Their track-laying, recently commenced, was carried southwestwardly to the Brazos River, nearly 7 miles, and is now being pushed at nearly a mile per day towards the Trinity, to the northeast.

The great body of their hands, however (now reduced by the hot weather of summer from 3,000 to 2,000 men), is already on the work at 70 to 90 miles from their initial point, the grading of their first 50 miles, demanded by the charter within one year from its date, being already done, and left far in their rear. The ties are delivered along their line, and the masonry is so far advanced as to warrant the completion of the whole distance to the Trinity River, 83 miles from the Brazos, within the time demanded for the first 50 miles. In fact, the prospect now is that the work will reach the county seat of Anderson County, Palastine, including the great draw-bridge across the Trinity, by the month of February, 1872.

Never have I witnessed more energy and efficiency displayed among railroad men. The Superintendent was drilled on the Union Pacific when performing its greatest prodigies, and has a reputation to sustain. I shall not give his name till he crosses the Trinity. He

asks but the golden lever to move the mountain before him.

THE GREAT NORTHERN.

The other end of the same lever is at work upon the road from Houston to Red River along and near the 95th meridian. This road, commenced about one year since, thoroughly and fairly entered upon in November, a month before the International's birth, is now running cars about 25 miles out upon their track, and is well advanced with its grading, up to the Trinity River, 80 miles from its initial point. We shall see which organization, drawing upon the same purse, and having nearly the same distance, will first span the great river of Texas.

This latter, however, has the material advantage of starting from a city where several railroads and perennial navigation present a thousand facilities.

PHYSICAL FEATURES.

For those who have an interest in the collateral information, furnished by these railroad surveys, I subjoin a few of the elevations shown by their profiles, reminding readers that the summits are all the lowest possibly available in crossing them.

The survey of the Central (Austin) Branch, shows a summit between the Brazos and Colorado waters of about 562 feet above tide-water, while the low water mark in the Colorado at Austin is 301 feet. The rise of the river at that point July 6, 1869—the highest known—was 47 feet. The summit of Mount Bonnell, three miles northwest from Austin (a cliff on the river), was 335 feet above low water May 12, 1871. This is one of the mountains of Texas. Others of the same range rise about 300 feet higher.

	Above mean tide. Feet.
International Railroad grade, bank of Brazos	285
" bottom of river, 6 feet below low water mark	230
" crossing of Central Railroad at Hearne	310
" grade at Navasota	307
" summit between Navasota and Trinity rivers	504
" grade at bank of Trinity, 83 miles	238
High water mark of 1866	225
Low water mark, (less 25 feet?)	190 ?
" Palestine, Anderson Co., 7.3 miles from Trinity	373
Great Northern Railroad, grade at Summit between Houston and Trinity, 71 miles	296.5
Great Northern, Trinity River at low water mark 79 miles	96.5
" " " high water mark	146.5

Thus it will be seen that the Trinity has a fall of 96.5 feet at low water mark in a channel distance of 270 miles, and an additional fall of 93.5 feet in 203 miles, to International Crossing. The Brazos River has a fall of 225 feet in a channel of 335± miles. The Colorado River has a fall of 300 feet in a channel of 303 miles.

TOPOGRAPHY AND GEOLOGY.

The Central, from Houston to the Brazos River, 57 miles, has so gentle a grade as to show neither cut or fill worth naming. Immediately after crossing the Brazos the line enters the hills of Washington County, and has continual vicissitude of surface, but within 50 feet grades for about 58 miles, to Giddings, its present terminus. Thence to near Wilbarger Creek the grades are gentle, whence for 20 miles, to Austin, the cuts and fills are heavy (for Texas), with grades, however, less than 50 feet. On the trunk line the Central has gentle grades all the way to Hearne, where the International crosses, with the exception of the 15 miles north from Bryan. This line is wholly within the tertiary formation, traversing sandstone outcrops from the vicinity of Navasota, 75 miles up. About Hearne and within a few miles, it cuts the ferruginous sandstone and ironstone, which makes an excellent building rock for abutments and culverts, and all other uses in masonry. The Western Branch traverses both kinds in like manner till it reaches the summit near Wilbarger; and thence to Austin it cuts the cretaceous limestone, which answers all the uses of masonry.

The International runs longitudinally through the ironstone region for many miles in the counties of Milam, Robertson, Leon, Anderson, (and Cherokee, probably), keeping along the range of iron hills; also traversing a most excellent sand rock, nearly granite in its hardness, near the Trinity. Its route is along the border of tertiary and cretaceous beds for most of this distance. It has gentle grades to the summit, between Navasota and Trinity, and thence about the Buffalo and Keechi, some heavy cuts and fills to the Trinity—a few grades as high as 50 feet. From the river to Palestine and beyond, the grades are gentle; but beyond, the line crosses all the affluents of the Neches, Angelina and Sabine, and will be found attended with heavy grading, over a hilly, wooded, but fertile and well settled country.*

* I will repeat here some general remarks, published in my original plea for this line in 1868. After analyzing, in detail, its topography from Cairo to the Rio Grande, I closed by the remark that on the entire line, of about 900 miles, the country was habitable and cultivable, or pastoral, without a single mile of exception, unless between the Nueces and Rio Grande, near Palafox, some few miles of chapparal in the pastoral belt might form the exception; that its grades, its hills, rivers and vales presented no engineering difficulties; no mountains intervening, nor scarce a respectable hill, and that no this shortest line, from the center of the future empire in North America to the Pacific, a much larger portion was futile and habitable (900-1450) than any other Pacific line; that it was *trans-latitudinal*, and have met the demands of commerce; and when completed would nearly supersede all other trans-continental railroads.

The Iron Hills it traverses, or rather threads, will thus be opened into use, and furnish the entire State, by the connections of this road, with inexhaustible supplies of the very best and most abundant and accessible ores. Wood, water, stone, ores and lignite coals in any required abundance, will be developed.

THE GREAT NORTHERN

crosses the International in the midst of these Iron Hills, which tend from northeast to southwest, and are 10 to 25 miles wide. The grade of this line from Houston northward, are of the gentlest kind for near 50 miles, to near a point some 15 miles north of the San Jacinto. Thence to the summit, about 300 feet high, the ascent is without hills, but in the descent to the Trinity several difficult cuts and fills occur, with grades 35 to 50 feet.

Near the Trinity the tertiary sand rock is traversed, some localities presenting very valuable building stone, but most of it too friable, disintegrating on exposure. The timber region traversed and touched on its western margin by this line of road, for 100 miles from the San Jacinto, iron of the very best on this continent.

It is not superlative to say that these two routes, of which your correspondent has said and written so much for the past five years in the commercial conventions and the public journals, have the most important future, if pushed with enlightened policy to completion, of any lines in the Trans-Mississippi. The Great Northern, bisecting *across the latitudes* the great fertile area west of the river, and reaching the sea by a line several hundred miles shorter than any other, and through a country of unbroken fertility from latitude 49 to the Gulf, and crossing all the mountain and trans. mountain railroads. The International, as above, furnishing a Pacific route, shorter by hundreds of miles than any other, *across the latitudes*, from the centre of the temperate to the border of the tropical zone, and terminating on the latitude of Hong Kong and Oriental commerce.

Apologizing for the length of this letter, devoted with paternal affection mainly to the two pets of my advanced years, I remain, very respectfully,

CALEB G. FORSHEY, C. E.

—The St. Louis *Journal of Commerce* says the new Union Depot at St. Louis will, it is understood, occupy the ground between Eighth and Eleventh streets, and Clark avenue and the grounds of the Pacific Railroad Company. This, it is supposed, will give room enough for the erection of a sufficiently commodious structure, but should more ground be needed it will be appropriated on the north, taking in Clark avenue. The building will be built almost exclusively of stone, embracing the needed offices, ladies' and gentlemen's sitting rooms, and every convenience suggested by time and experience. The bridge, when completed, will play an important part in this grand scheme At its western terminus, on Third street, trains will enter the tunnel and emerge on Clark avenue and Eleventh street, and then back into the depot. The tunnel, instead of being built of stone, as heretofore supposed, willl be constructed of iron, which, throughout most of the entire length of the tunnel, will come to the surface, and in some places rise above it; so that the operation of construction will be more in the nature of digging a trench than of boring a lateral passage. The *Times* says that when the bridge and the depot are completed, Eastern trains will not stop till they reach the Union depot, which, it is thought, will be almost equally convenient for the roads on the western bank of the river. It is generally conceded that if the plan is carried out, the repair shops of the various companies, and the general freight depot, will also have to be located on this side. Such is the outline of the plan of this vast undertaking—a plan which has met, and will continue to meet determined opposition, but which has been so far matured that, after its feasibibility, cost, and even the architecture and all the minor details of the building have been considered, the meeting to be held on next Friday will be called upon to take final action on it. Thomas A. Scott, Vice-President of the Pennsylvania Central Railroad Company, and Mr. A. Boody have been the prime movers in the matter, and though other Eastern roads have had a hearing, the plan is chiefly in the interest of the Pennsylvania Company.

TRAFFIC AND EARNINGS.

—The report of the Atchinson, Topeka & Santa Fe Railroad Company, for the year ending April 1, shows the following:

Total earnings	$230,858 02
Operating expenses	139,872 25
Net earnings	$ 90,985 77

The operating expenses were 56.58 per cent. of the receipts; including taxes, 60.58 per cent. The gross earnings per mile were $4,309.70; net earnings, $1,698.51.

—The traffic receipts of the Grand Trunk of Canada for the week ending May 27 amounted to £31,200, against £30,100 in the corresponding week of last year, showing an increase of £1,100, or about 3½ per cent.

—The traffic receipts of the Great Western of Canada for the week ending May 26 amounted to £16,658, against £15,936 in the corresponding week of last year, showing an increase of £722, or 4½ per cent.

General Railroad News.

CHICAGO RAILROAD NEWS.

Illinois Central.

The company has commenced the construction of a new round house with stalls for 32 engines on the lake shore at the foot of Fourteenth street. It will be of brick with a stone foundation and an iron and slate roof. One-half of it is to be completed this year.

Chicago & Northwestern.

The iron on the Baraboo Air Line had last week been laid eight miles beyond Madison, to within twelve miles of Lodi. The iron is being laid at the rate of half a mile a day. Work has been commenced on the bridge over the Merrimack River, and grading has been begun west of Baraboo.

Mr. George L. Dunlap, who has been connected with this company from the beginning, and has had charge of its operation as General Superintendent or General Manager for thirteen years, has resigned his position as General Manager, and is succeeded by Col. James H. Howe, who has been Solicitor of the company since 1864.

Mr. George L. Dunlap is a native of Brunswick, Me.; while still a youth he commenced the practical study of civil engineering on the Fitchburg Railroad, in Massachusetts. He was for three years a clerk in the Superintendent's office of the Boston & Maine Railroad, went thence to the Western Vermont Railroad, and after a few months' service on that road was appointed, near the end of 1852, General Ticket Agent of the New York & Erie Railroad, a position which he occupied for nearly four years. In 1855 he came to Chicago and was engaged, we believe, on the surveys for the "Chicago, St. Paul & Fond du Lac Railroad," now the Wisconsin Division of the Chicago & Northwestern. In 1856 he was appointed Assistant Superintendent and Engineer of that road, when it was in operation from Chicago to Woodstock, 50 miles. In 18 8, when that road was reorganized under its present name, Mr. Dunlap became General Superintendent, a position which he held until one year ago, when he was appointed General Manager. During this period of his service he has seen his company's property grow from a single short line of 50 miles to a vast system of lines of 1,400 miles with three important extensions well under way.

Mr. Dunlap's experience has been so varied as to give him an intimate acquaintance with more departments of railroad business than one man usually acquires. His opinion on matters connected with mechanical as well as civil engineering carries great weight, and his knowledge of the routes of traffic is well shown by the wise location of the lines of the Northwestern which it has constructed under his direction.

We understand that Mr. Dunlap will hereafter engage in the business of railroad construction, for which he has rare qualifications, and in which, if the future is to be like the past three or four years, he will find an abundant field for the exercise of energy and ability, and, doubtless, opportunities for profits, such as are impossible in any salaried position.

Mr. Howe, who succeeds Mr. Dunlap, is also a native of Maine, but in his eighteenth year became a citizen of Wisconsin, residing in Green Bay from 1847 till 1859, most of the time engaged in the practice of law. In 1859 he was elected Attorney-General of Wisconsin, and resigned that office in 1861 to become Colonel of the Thirty-second Wisconsin Infantry, with which he served until 1864, when he was appointed General Solicitor of the Chicago & Northwestern.

Michigan Central.

A survey has been made for a line to connect the Air Line with the Detroit & Hillsdale, and in connection with these and the Central for a new and shorter through line between Chicago and Detroit. A line has been run from Manchester, on the Detroit & Hillsdale, — miles west of Ypsilanti, west to Homer, which is on the Air Line, — miles west of Jackson. This line is 39 miles long. Why it should be constructed to Manchester is not easy to see, as it would then have to run along the Hillsdale road for 12 miles, reaching it first at Brooklyn. The line from Chicago to Detroit by this design would be as follows:

	Miles.
Michigan Central, Chicago to Niles	93
Air Line, Niles to Homer	80
New line, Homer to Brooklyn	27
Detroit, Hillsdale & Indiana, Brooklyn to Ypsilanti	36
Michigan Central, Ypsilanti to Detroit	30
Total	266

as against 284 miles by the main line of the Central, and 272 miles by the Central and Air Line *via* Jackson. All the lines are controlled by the Central, which, when all are open and in condition, will thus be able to save 18 miles on the present route to Detroit and the East, by which time, probably, the Canada Air Line will give it a line only 495 miles long to Buffalo, 917 miles long to New York by the Erie, and 935 miles by the Central.

The earnings from all sources for the second week in June were $95,240.66; on the main line, $85,896.52, and for the same week in 1870, $71,676.79, showing an increase of $14,219.73, or nearly 20 per cent. "Round trip" tickets between this city and St. Joseph are sold for $3.00. This arrangement is made to accommodate visitors to the fruit region who wish to make closer connections than are afforded by the lake steamers. The Chicago & Michigan Lake Shore road is completed to Whitehall, 16 miles northeast of Muskegon, on the lake shore, passing, from St. Joseph, through Saugatuck, Holland, Nunica and Muskegon. Since Monday last one train a day has been run through between New Buffalo and Whitehall.

Chicago & Alton.

The track-layers will begin work, next Monday, at Roodhouse, and will probably be able to advance without interruption toward Louisiana. The foundations

of the bridge over the Illinois River are nearly ready for the superstructure, and the work, which the American Bridge Company has in charge, will be completed so as to cause no delay in operating the road. West from Louisiana the track is now laid about 32 miles.

OLD AND NEW ROADS.

Southern Pacific of California.

The newspapers are constantly confounding this road with the new line from the Red River to San Diego, provided for at the last session of Congress. The former will form no part of the San Diego line, but is a line southward from San Francisco controlled by the Central Pacific Company, intended primarily for local business, but also, eventually, to intersect the San Diego road near the southeast corner of California.

Cincinnati & Springfield Short Line.

It may be regarded as a confirmation of the harmonious relations between the Vanderbilt party and the Baltimore & Ohio, that the latter gives an entrance into Cincinnati for the former's new line to Springfield. The terms are stated at follows:

"The Cincinnati & Springfield Short Line Company to pay $35,000 per annum until the double track shall be completed, within three years, then $40,000 per annum for five years, and ever after that $45,000 per year. And, as stated some time since, the Cincinnati & Springfield Company takes $100,000 of the first mortgage bonds of the Cincinnati & Baltimore Company. Furthermore, $35,000 per annum of the lease money named above is to be guaranteed toward the payment of the interest on the $500,000 issue of bonds by the Cincinnati & Baltimore Company. We understand that the stock of the Cincinnati & Baltimore Company has been taken with the exception of about $135,000."

West Wisconsin.

The company's bridge over Lake St. Croix, at Hudson, will be a mile long, and will give employment to 100 men and three steam engines until winter, probably.

Costa Rica Railroad.

It is reported that the government of Costa Rica has let the contract for the construction of a railroad from San Jose, the capital, eastward to Sinion Bay, on the Atlantic coast. This line will be a little more than 50 miles long and will reach just about half-way to the Pacific coast. Its terminus on the Atlantic is about 225 miles nearly due west of Aspinwall.

Northeast Pennsylvania.

Engineers are surveying a line for this proposed road from Halboro' northward to Hartsville, not far from the York road.

Great Western of Canada.

This company changed the gauge of its Sarnia Branch from London to Sarnia, 61 miles, on the 9th inst., within the space of 8½ hours.

Bell's Run Railroad.

A route has been determined on for this road, and it is to be graded this summer. It will extend from Bell's Mills, on the Pennsylvania Railroad seven miles northeast of Altoona, northwestward up Bell's Run, and crossing the Alleghenies at Bell's Gap, to a point on Clearfield Creek, in Cambria County. Some of the gradients will be 1 0 feet to the mile. It is to be a narrow-gauge road.

Union Pacific.

We learn from Mr. Hallock, the agent of the Union and Central Pacific roads in this city, that there has been a very satisfactory development of the freight business over the line this season. In the eastward business wool has formed a very considerable part of the shipments, and the light weight of this staple, in proportion to its value, makes it probable that this is a traffic which will increase, the advantages of the Pacific coast for wool growing being very great. Tea shipments are also largely increased, indicating that the experiments of last year have proved successful and profitable. Among other leading shipments in this direction are ore, wine, hides and leather. The chief shipments westward are general merchandise, machinery, agricultural implements, etc.

California Pacific Eastern Extension.

George Alfred Townsend, writing from San Francisco, says that Milton S. Latham, one of the directors of that company, told him that the Pennsylvania Railroad Company "had no part nor interest in this extension, that it was European and California capital, and "that 100 miles of the road would be laid during the "present year." It seems that the contract let is for a line from Davisville, 12 miles west of Sacramento, nortward, *west* of the Sacramento River, in the direction of Shasta.

Green Bay & Lake Pepin.

Green Bay has voted to subscribe $100,000 to the stock of this road, and Fort Howard has added $20,000 to the amount.

Springfield & Illinois Southeastern.

The section of this road between Springfield and Beardstown was opened by an excursion on the 22d inst.

Muscatine & Northern.

A route for a railroad is to be surveyed from Muscatine northward through Tipton to Anamosa, 50 miles, and thence northwestward to Independence, Iowa, 40 miles

Toledo, Peoria & Burlington.

The Burlington (Iowa) *Hawkeye* of the 14th, says: "Mr. Gear received a letter from President Secor, yesterday, saying that the iron had been bought for the completion of the Toledo, Peoria & Burlington Railroad into this city, and that the work will be completed in September."

This road, only a few miles long from La Harpe, on the Toledo, Peoria & Warsaw road, northwestward to a point on the Burlington & Carthage Branch of the Chicago, Burlington & Quincy, which will give it an entrance into Burlington.

Lehigh Valley.

The Lehigh Valley Railroad Company has let the contract for building a bridge across the Susquehanna and Campbell's Ledge, for their branch road to West Pittston Shaft, and the work will soon be commenced. This branch is constructed to carry coal from the West Pittston Works, which recently came into the hands of the Lehigh Valley Railroad Company, and to avoid the payment to the Lackawanna & Bloomsburg Railroad Company of six cents for freight to the Lackawanna & Bloomsburg Junction. It is contemplated to continue this branch, and connect it with the main track by erecting another river bridge near Port Blanchard, but nothing has yet been done, we learn, towards that portion of it.—*Pittston Gazette.*

Reading & Lancaster.

The Reading *Times* gives the following as the route of the proposed narrow-gauge railroad between that city and Lancaster: "The idea is to follow as nearly as possible the three almost interesting creeks, the Conestoga, the Muddy Creek, and the Wyomissing, and accommodate Lancaster City by authorizing a branch road to be built to the Susquehanna, to connect with the Columbia & Port Deposit Railroad. In following the Conestoga, and striking along the villages of Earlville, Brownstown, Tannersville and Hinkletown, thence along Muddy Creek *via* Frysville, Davisville and Adamstown to Gouglersville, thence along the Wyomissing *via* Mohnsville to Reading, would make a direct and at least ten miles shorter route between the two cities than that of the Reading & Columbia road, while a different section of the country would be traversed, and opened up to development and improvement." Such a road would form a line from Reading southwest through Lancaster to the Susquehanna, about 40 miles, almost parallel with the Reading & Columbia road, and for more than half the way only three or four miles from it.

Chicago, Dubuque & Minnesota.

By the telegraph we learn that there are about 3,000 men at work on this company's line between Dubuque and the Minnesota line, along the Mississippi River, that iron is arriving, and that it will be laid at once. A few miles are already completed, and a construction train is running on it.

Dubuque, Bellevue & Mississippi.

The grading of this road from Dubuque down the Mississippi to Bellevue, about 22 miles, is completed. It is to be opened in connection with the Chicago & Iowa road, thus making a new route between Chicago and Dubuque.

Middletown & Crawford.

The grading of this road, which is to extend from Middletown, N. Y., (on the Erie Railway 66 miles from New York) northeast 12 miles, is nearly completed, and the track will be laid within a few weeks.

Union & Titusville.

It is reported that this road, lately opened from Titusville up Oil Creek to Union, 25 miles, has been purchased by the Erie Company, and that the latter will extend it to Dunkirk, about 45 miles. The Erie now connects with it through the Atlantic & Great Western, which touches its northern terminus near Union.

The Great Southern Mail Route.

The mails from New York to New Orleans, heretofore transported by way of Chattanooga and Grand Junction, Tennessee, and Canton, Mississippi, have, by order of the Postmaster General, been changed to the New Alabama & Chattanooga route running by an air line from Chattanooga to Meridian, Mississippi, and thence over the Mobile & Ohio Railroad to Mobile, and thence to New Orleans over the New Orleans, Mobile & Texas Railroad. It is stated that by this new route the mails will reach New Orleans twelve hours sooner than by the old route.

North Carolina Railroad.

At Raleigh, N. C., on the 19th inst., Judge Bond, of the United States Circuit Court, issued an injunction, restraining the North Carolina Railroad Company from paying into the State Treasury the dividends up on the stock which the State holds in the road, and appointing S T. Philips, of Raleigh, receiver of all moneys now or hereafter to be paid as dividends upon stock. The court declares that the bond holders' lien on the stock must be satisfied before dividends can be paid.

Missouri, Kansas & Texas.

A Kansas paper says: "The Missouri, Kansas & Texas Railway Company are about to build a road from Americus to Cottonwood Falls, and, eventually, down the Walnut. It is only sixteen miles from Americus to Cottonwood Falls. As soon as the road is completed to Arkansas City, only 100 miles, it will control the cattle trade of Texas in spite of any other road. Americus, Toledo and Cottonwood Falls offer $100,000 for the sixteen miles of road; and Chase, Butler and Cowley Counties offer $500,000 to continue the road to the State line."

To operate such a line economically it will be necessary for the Missouri, Kansas & Texas to extend its "Osage Division," now completed from Holden to Harrisonville, westward through Paola to Americus, and also an outlet eastward from Holden, which will probably be by a line northeastward to some point on the Louisiana and Missouri River road. About 250 miles of road must be constructed (much of it is underway) before the line can be complete.

Pacific of Missouri.

The President, Mr. Joseph Brown, has contracted with the Vulcan Iron Works, of St. Louis, for 7,000 tons of railroad iron, at $74.00 per ton—making a total contract of $518,000.

The rails are to be equal to English manufacture, and will be used for finishing the Lexington & St. Louis Railroad, and relaying track on the Missouri Pacific.

Des Moines Valley.

The President and directors of this company, with Mr. Andrew Carnegie and a party of the Pennsylvania Company's officers, made an excursion over the line on the 13th. The Keokuk *Gate City* of the 14th gives as the result of the late nogotiations:

"The Des Moines Valley Company keep their road.

"That's the result of the visit of Messrs. Kilbourne, Reid and Leighton to New York, and their conference with Edgar Thompson and the Pennsylvania Central and other railroad interests."

Detroit, Eel River & Illinois.

This new company has been organized to carry out the old project known as the "Eel River Railroad." The Detroit *Tribune* says:

"As many of our readers are aware, the managers of the Detroit, Hillsdale & Indiana Railroad contemplated from the outset the extension of the road into Indiana, with Logansport as a point, whence a shorter and more direct line to St. Louis would be gained. A company was organized several years since, which built several miles of road bed from Logansport up the Eel River Valley, which is said to be one of the richest and most productive agricultural regions in Indiana. The iron was purchased for the road, but the war came on, times were hard, the company were unable to meet their liabilities otherwise, and sold the iron. The project has been again revived, and with a certainty of success. The franchises of the old company have passed into new hands, and a company has been organized called the Detroit, Eel River & Illinois Railroad Company, and they are now actively at work. The Detroit, Hillsdale & Indiana road is shortly to be extended to a junction with the Fort Wayne & Jackson road; and when the Eel River road, which also forms a junction with the latter road, is built, trains to and fro from this city will pass over the entire line regularly, opening up to us a new and wealthy region of country, and materially shortening the distance between Detroit and St. Louis.

Ottawa, Oswego & Fox River Valley.

The supervisors of towns holding stock in this company some time since appointed a committee to investigate whether the "rights" of public stockholders were being "respected." The committee has learned and reported that there is no "record of the sale of that portion running from Streator to Wenona. The only circumstance coming to our notice which would indicate that the portion referred to had ever been owned by the Ottawa, Oswego & Fox River Valley Company was this: The stock-book showed that $71,000 stock had been issued to towns and individuals along the line of that piece of railroad. In explanation it was stated by Mr. Plumb, Treasurer of the Fox River Valley Company, in substance, 'that this stock had been issued in lieu of subscriptions and right of way, while the road was a portion of the Ottawa, Oswego & Fox River Valley Railroad. That subsequently the company found it necessary to sell that portion of their road without making provision for the cancellation of the stock so issued.' By this operation it will be seen that the road from Streator to Geneva is made responsible to the extent of $71,000 for subscriptions made to that portion of road running from Streator to Wenona, and now owned by the St. Louis Railroad Company."

They also found that on the 20th of January, 1869, Mr. Oliver Young contracted to build the road from Streator to Geneva, for $650,000, in county and town subscriptions. Afterward Mr. Young assigned his interest in this contract to C. H. Force & Co., who agreed with Mr. Joy that the company should issue $1,200,000 first mortgage bonds, which should be negotiated by Mr. Joy at 80 cents on the dollar, and pay to C. H. Force & Co. The consideration to Mr. Joy was that he should receive the whole amount of stock issued, $1,190,000, less the amount to be issued to individuals or municipalities for supplies in aid of the road. Mr. Joy also agreed to procure the equipment and running of the road by the Chicago, Burlington & Quincy Railroad Company, in consideration of a lease in perpetuity, under which the said company will be obligated to pay the last mortgage bonds, amounting to $1,200,000, bearing interest at 8 per cent. per annum. The committee also found that the road has been leased in perpetuity to the Chicago, Burlington & Quincy Company.

Memphis & Ohio.

The directors of this company have passed a resolution requesting "that the formal articles of consolidation between this company and the Louisville & Nashville Company shall be entered into in accordance with the terms set forth in said agreement on or about the first day of October, 1871."

The road has long been operated by the Louisville & Nashville Company, forming its route to Memphis and its connection to the New Orleans and Mobile routes.

Danville, Hazleton & Wilkesbarre.

This company is extending its line eastward towards Hazleton, but will probably be met before it reaches that place by a branch of the Lehigh Valley from Hazleton westward eight miles to the coal field recently occupied by the Central Company, which is to be completed by September or soon after. Together these will complete a new and pretty direct route from the Delaware to the Susquehanna.

Rockford, Rock Island & St. Louis.

It is reported that this company will make an effort, before the close of the year, to acquire an independent route from Alton Junction to East St. Louis. It now uses the track of the St. Louis, Alton & Terre Haute road.

Quincy, Missouri & Pacific.

The President of the company, Mr. C. A. Savage, has purchased, in New York, fifty miles of railroad iron, 2,500 tons, to be shipped *via* Chicago, and 2,000 tons *via* New Orleans, to be delivered at West Quincy from August to November.

Mississippi River.

At the annual meeting of the stockholders, held last week, the President, Mr. A. T. Lacey, submitted his annual report, in which he details the annulling of the contract for the construction of the road, made with the Southern Railroad Association. The Association agreed to loan the company $166,468.74, for one year, at 7 per cent. interest, in order to be released from their contract. The directors have also compromised with Mr. A. S. Mitchell, former President of the company, by paying him $25,000 in first mortgage bonds, instead of $50,000, as claimed by him under the contract.

An agreement for a consolidation (since ratified) was entered into with the Paducah & Gulf Railroad, which, it is believed, will enable the company to complete the road from Memphis to Paducah during the coming year.

There has been expended in the construction proper of the road, to this date, $196,266.53, and in expenditures incidental to construction, $109,520.93.

The Paducah & Gulf road is in operation from Paducah, Ky., southwestward 63½ miles to Troy, Tenn., to a junction with the Mobile & Ohio Railroad. Troy is to be the northern terminus of the Mississippi River road.

Shenandoah Valley Railroads.

The Richmond *Whig* of the 14th says: "Every summer, for years past, we have been cheered with the exclamation that one or more railroads were to be forthwith constructed in the valley. The Valley road, under the auspices of Baltimore, was first on the *tapis*. Surveys and subscriptions have again and again been completed, or so nearly done as to leave no further doubt about the road. Still, however, there was always something lacking—a screw loose somewhere. But at last, during the past week, the company was fully and legally organized at Staunton, by the *unconditional* subscription of $200,000—half by Staunton and half by the Baltimore & Ohio Railroad Company. This, we suppose, will insure the completion of the road from Harrisonburg to Staunton. To insure the extension to Salem there is still wanting the sum of $220,000—for the subscription of a million by the city of Baltimore, and a million by the Baltimore & Ohio Company, is contingent on this sum being subscribed along the line.

"While the Valley road is thus active, the Shenandoah Valley road is quite as noisy as it was twelve months ago. A few days since, the *Enquirer* announced: 'In the Shenandoah Valley, the survey has 'been completed and the road put under contract, and 'the work will be pushed rapidly through to completion '—of this we are well assured.'

"Last July, nearly a year ago, we published a special dispatch from Philadelphia, announcing, as by authority, the identical same things—surveys made and contracts let, and road to be completed in two years. That was all of it—except the ceremony of breaking dirt at Front Royal in September."

Rockford Central.

The Rockford *Journal* of the 17th says:

"The line between here and Rochelle, by way of New Milford, has been surveyed, and the right of way from the city limits to Rochelle has been secured. A corps of engineers is at work now on the Stillman Valley route, which will be completed from Rochelle to Rock River by Thursday next, when the most feasible of these routes will be decided on by the directors, and work will then be commenced on the entire line, as many men being put to work as can be worked to advantage.

"The contractors, Messrs. T. F. Abbott & Co., are now in the city ready with a strong gang of men to commence work."

The location of the line between Rockford and Rockton was to have been decided upon this week.

Roanoke Valley.

A contract has been made for the construction of this road from Keysville, Va., where it forms a junction with the Richmond & Danville Railroad, southward *via* Clarksonville, Va., to the Manson Junction, on the Raleigh & Gaston road, 53 miles, conditional, however, on local subscriptions of about $3,000 per mile. From Manson Junction to Clarksville, 22 miles, the road was operated before the war, but the iron was taken up for use on military lines.

Detroit, Lansing & Lake Michigan.

This road is now in operation between Detroit and Plymouth, 23 miles. The route follows the Michigan Central road from Detroit to Grand Trunk Junction, where it bends to the northwest, passing through Redford, Fisher's, McKenny's and Livonia to Plymouth. The iron is laid for nine miles beyond Plymouth, to near Salem, in Washtenaw County. The track is also laid for ten or twelve miles east from Lansing, and a large force is working at that end of the line. It is hoped to have the road open from Lansing to Detroit during August next. From Lansing northwest to Greenville, 58 miles, this road has been for some time in operation.

California Railroads.

The San Francisco *Bulletin* of June 12 says: "With the opening of summer there is renewed activity in railroad building in California. In the lower part of the State, besides the Southern Pacific, which is going ahead beyond Gilroy, work has been resumed on the San Joaquin Valley, already completed twenty miles beyond Stockton, and forty miles additional will be finished during the present season. The Copperopolis Railroad, built for twenty-eight miles from Stockton, is also to be pushed forward. Here we have two railroads, on nearly parallel lines, now under way in the San Joaquin Valley, pushing for the southern extremity of the State; while a line nearer the coast, a third road, the Southern Pacific, is advancing in the same direction. The commencement of the Texas Pacific from San Diego may be reckoned as one of the certain events of the season. What may be done with the projects for one or two branch lines to intermediate towns on the coast, remains to be seen. North of San Francisco a large force is at work grading for the Sonoma Branch of the Vallejo, or California Pacific Railroad. A report is current that a contract has also been let for 145 miles of the Eastern Extension of this road, reaching from Davisville, a few miles southeast of Sacramento, to a point in the Upper Sacramento Valley, near Shasta. The report is probably premature. This section of the Eastern Extension will be entirely on the west bank of the Sacramento River. On the east bank, the Oregon Branch of the Central Pacific is already in operation 127 miles north of the State capital, and is to be extended to the Oregon border, about 200 miles further."

Kansas Pacific.

The accounting department of the company—Mr. S. T. Smith, Auditor—was moved, on the 20th, from St. Louis to Kansas City. Mr. Smith issues a circular requesting that all communications for his department be hereafter addressed to him at the latter place.

Wilmington & Reading.

The following account of the route of a proposed branch of the above road to the Lehigh coal region has been given by J. Dutton Steele, the Chief Engineer of the Wilmington & Reading: "The proposed road would commence at New Tripoli, Lehigh County, at the terminus of a road some nine miles in length now in course of construction by the Lehigh Valley Road from Slatington, and down the valley of the Maiden Creek to the mouth of the stream, thence follow the Schuylkill to Reading, and pass down the west bank of the river to Birdsboro, where it would join the Wilmington & Reading. The entire length would be about 35 miles, and the cost not above one million of dollars. There is a gradual descending grade the whole distance. A proposed lateral extension of the road penetrating to the Schuylkill coal region through the Blue Mountains, at first contemplated, is now regarded as impracticable. It is estimated that one million tons of Lehigh coal could be brought to market over the new road the first year after its opening, and that that article could be delivered at Reading at twenty-five cents per ton less than it is now delivered by the Philadelphia & Reading —a saving to the manufacturing interests of this city of $25,000. Iron could also be shipped to New York at from $2 to $2.25 per ton, the present rate being $2.75. A direct and cheap communication would also be afforded with the lakes on the north and the tide-water of the Delaware on the south. From these facts Mr. Steele predicted a very flattering success for the new road."

Wilkesbarre & Williamsport.

On the 13th of May the Governor of Pennsylvania approved an act for granting a charter for constructing a railroad from Wilkesbarre to Williamsport, by way of Bloomsburg and Fishing Creek. It will pass a short distance south of Hughesville and connect with the Muncy Creek Railroad, thus connecting with the Sullivan coal fields. The distance will be shortened to Wilkesbarre by about 17 miles from Williamsport. From Wilkesbarre to Bloomsburg, about 38 miles, the route will be down the Susquehanna River and nearly parallel with the Lackawanna & Bloomsburg Railroad —west-southwest. From Bloomsburg the route will be west-northwest, cutting off the angle between the Susquehanna and the West Branch, following up Fishing Creek and down Muncy Creek to Muncy, and up the West Branch to Williamsport. The total length is about 80 miles. Such a road would connect by a shorter line the northern anthracite coal field with the lumber regions of the West Branch of the Susquehanna and with the Northern Central and the Philadelphia & Erie railroads.

Chester & Tamaroa.

A correspondent of the Chicago *Tribune* says: "The Chester & Tamaroa road is well on the way to completion, and by the middle of September next it is promised that we will have railroad connection with the Garden City of the West *via* Tamaroa, on the Illinois Central. And next year it is promised that the Chester & Tamaroa road will be extended to Mount Vernon, Jefferson County; thence across the State to Evansville, Ind.

Grand Rapids & Indiana.

Jesse L. Williams, Receiver of the Grand Rapids & Indiana Railroad Company, has made his final report and account as such, and has been discharged from the duties thereof by an order of the Circuit Court of the United States for the Western District of Michigan. J. K. Edgerton, in his official announcement of the same, says the contract now in force between the Grand Rapids & Indiana Railroad Company and the Continental Improvement Company obligates the latter to complete and equip, at its own cost, the Grand Rapids & Indiana Railroad with all its structures, material, furniture and appurtenances, including station grounds and right of way, suitable for a first-class railroad from its terminus in Fort Wayne to Little Traverse Bay, Mich., 330 miles, by June 3, 1874, in consideration of which the Continental Improvement Company has the right during the period of construction to operate the road, receiving its earnings, etc., but will pay all expenses for running the same. The road north of Paris, its present northern terminus, 200 miles from Fort Wayne, is being pushed forward rapidly.

Iowa Midland.

Track-laying on the extension of this road from Maquoketa to Anamosa was to commence on the 15th instant. The grading of this portion of the line, with the exception of a rock-cut west of Monmouth, will probably be completed this month.

St. Louis & Cairo.

This company is now engaged in making a final location of its line and securing the right of way.

ELECTIONS AND APPOINTMENTS.

—The General Ticket Department of the St. Louis, Belleville & Southern Illinois Railroad Company is now in charge of Mr. H. S. DePew, General Passenger Agent. The business was formerly attended to by the General Superintendent, Mr. W. C. Broughton.

—Mr. C. P. Oakley has resigned the General Freight and Ticket Agency of the Mississippi & Tennessee Railroad, and Mr. F. H. White was, on the 15th, appointed to the office. Mr. Oakley has since been appointed General Ticket Agent of the Memphis & Little Rock Railroad.

—The Lee & Hudson Railroad Company (Mass.) has organized by electing the following directors: P. C. Baird, Elizur Smith, S. S. Roger, of Lee; T. O. Hurlbut, of South Lee; John B. Hull and H. J. Dunham, of Stockbridge; C. W. Kniffin, of West Stockbridge; John M. Seeley, of Housatonic, (Great Barrington); R. F. Mason, of Lenox Furnace; George H. Power and Lucius Moore, of Hudson, N. Y.

—At the annual election of the Chester & Tamaroa Coal & Railroad Company, held in Tamaroa on the 5th inst., the following directors were elected: D. C. Barber, Tamaroa, Ills.; W. P. Cutler, Constitution, O.; Gen. B. R. Cowen, (Assistant Secretary of Interior) Washington, D. C.; W. G. Barnard, Bellaire, O.; R. R. Dawes, Marietta, O.; E. C. Dawes, Cincinnati, O.; James Ritchie, Pinckneyville, Ill.; J. C. Holbrook, Chester, Ill.; J. H. Barber, Richview, Ill.; E. V. Pierce, Z. P. Curlee, F. M. Sams, Tamaroa, Ill.; R. M. Davis, Pinckneyville, Ill. D. C. Barber was chosen President and General Superintendent; Z. P. Curlee, Secretary; R. M. Davis, Treasurer; W. B. Stephenson, of Cincinnati, Secretary; Geo. W. Carett, of Tamaroa, General Freight Agent, and R. D. Carothers, of Tamaroa, Assistant Superintendent.

—The following directors and officers of the Cedar Rapids & Missouri River Railroad Company were elected at Cedar Rapids on the 15th: John B. Alley, Oliver Ames; 2d, John R. Blair, John Bertram, D. C. Blair, John F. Ely, W. F. Glender, C. F. Hazlice, C. A. Lombard, Fred Nickerson, S. L. Thorndyke, Joseph Nickerson, W. W. Walker, Horace Williams and James F. Wilson. Officers: President, Horace Williams, of Clinton, in place of John I. Blair, resigned; Vice-President, F. Nickerson, in place of W. W. Walker; Secretary, W. W. Walker; Treasurer, John Bertram; Assistant Treasurer, John Van Deventer; Register, D. P. Kimball.

—At the annual meeting of the Iowa Falls & Sioux City Railroad Company, held on the 15th, the following directors and officers were elected: John B. Alley, Oliver Ames, I. A. Allison, John I. Blair, Prince S. Crowell, Wm. T. Glidden and Horace Williams. Officers: President, Horace Williams; Vice-President, William T. Glidden; Treasurer, John Bertram; Assistant Treasurer, James Van Deventer; Secretary, Chas. E. Walker.

—At the annual stockholders' meeting of the Hastings & Dekota Railroad Company, held in Hastings, Minn., on the 14th, the following directors were elected: Oakes Ames, North Easton, Mass.; Alex. Mitchell, Milwaukee; Russell Sage, New York; N. A. Cowdrey, New York; F. P. James, New York; Selah Chamberlain, Cleveland; W. S. Gurnee, New York; L. P. Morton, New York; Julius Wadsworth, New York. The only change in the Board is the substitution of Selah Chamberlain for W. G. LeDuc. The following officers were also appointed: President, Alex. Mitchell; Vice-President, Russell Sage; Chief Engineer, A. B. Rogers. All the directors, with the exception of Oakes Ames, are directors also of the Milwaukee & St. Paul Company.

—Mr. Charles E. Stewart has been appointed Master Mechanic of the Panama Railroad. He has been connected with the mechanical department of this road at Aspinwall for a number of years.

—The annual meeting of the grantees of the proposed New Hampshire Central Railroad from Freedom, on the Maine line, to Danbury, on the Northern Railroad, *via* Ossipee, Moultonboro', Center Harbor and Bristol, being a connecting link of a proposed route from Portland to Oswego, N. Y., was held last week at Meredith Village, N. H. The following directors were chosen: Oscar F. Fowler, Wm. Dyer, W. H. Mason, Wm. Weed, Larkin D. Mason, Henry J. Banks. Hon. O. F. Fowler, of Bristol, was chosen President; Cyrus Taylor, of Bristol, Treasurer, and George T. Crawford, Clerk. An address was delivered by John A. Poor, Esq., of Portland. The prospects of the road are said to have never looked more favorable.

—The directors of the Portland, Saco & Portsmouth Railroad Company have elected the following officers: President, Thornton K. Lothrop, of Boston; Clerk, Charles E. Barrett, of Portland; Treasurer, Eliphalet Nott, of Saco.

—The officers of the South Side (L. I.) Railroad Company, recently elected, are as follows: Charles Fox, President; Wm. Floyd Jones, Vice-President; O. M. Denlon, Treasurer, and W. H. De Bevoise, Secretary.

—The directors of the Hudson Suspension Bridge & New England Railway Company are: Benjamin E. Smith, Hiram Barney, D. C. Littlejohn, E. W. Serrell, Chas. J. Pusey, Andrew Carnegie, Clark R. Briggs, A. S. Diven, Job H. Jackson, A. W. Humphreys, L. T. Guthrie, E. R. Wisewell and Charles Dawson. The officers are: Charles J. Pusey, President; Clark R. Briggs, Vice-President; Charles Dawson, Treasurer; Gen. E. W. Serrell Chief Engineer.

—We learn that Mr. O. Chanute, the engineer who so distinguished himself by the successful construction of the Kansas City Bridge, and who has since been Chief Engineer of the Missouri River, Fort Scott & Gulf and the Leavenworth, Lawrence & Galveston railroads, has been appointed General Superintendent of the latter road, in place of M. R. Baldwin, resigned. The Kansas City *Journal of Commerce* gives the following enumeration of the important engineering works of which Mr. Chanute has had charge in that vicinity:

"Mr. Chanute has acted, while here, in the several capacities of Chief Engineer in the construction of our bridge across the Missouri River, where one and a half millions were expended under his immediate supervision, and which was rendered doubly difficult from being the first attempt to span our treacherous river; as Chief Engineer in the construction of the Missouri River, Fort Scott & Gulf Railroad; of the Leavenworth, Lawrence & Galverton Railroad; of the Kansas City & Santa Fe Railroad; of the Atchison & Nebraska Railroad (an extension of the Missouri River road north to Atchison); of the Kansas City Stock Yards, and lately appointed Engineer of our city. The several railroads and bridge involving an expenditure of nearly fifteen millions of dollars, more than half of which has been disbursed through his immediate and personal direction."

Mr. Chanute will have his office and residence in Lawrence, Kansas, removing thither from Kansas City. He remains Chief Engineer of the Lawrence road.

The Slide-Valve.—III.

BY C. DRAPER, A. B., L. C. E.

(Continued from page 120.)

Since, as we have before remarked, the motion of the eccentric is precisely similar to that of the crank, we can represent by diagram, or calculate, the relative positions of the center of the eccentric and the slide-valve, or valve-rod pin, in the same manner as described for those of the crank pin and piston, or cross-head pin, in our last paper, taking, instead of the stroke of the piston, the travel of the valve, and, instead of the length of the connecting rod, the length of the eccentric rod; for it is obvious that the relations between the crank, connecting rod, piston rod and pis are similar to those between the eccentric, eccentric rod, valve rod and valve, the dimensions only differing.

There is this practical difference, however, that since the ratio of the length of the eccentric rod to the throw of the eccentric is always very much greater than that of the length of the connecting rod to the throw of the crank, the effects of the obliquity of the eccentric rod

may, in most cases be left out of consideration. Thus, in Fig. 14, let e be the centre of the crank shaft, and describe round it a circle whose radius is the throw of the eccentric, then the circle will be the path of the center of this eccentric Let $C\,B$ be the center-line of the valve rod produced, and let $A\,B$, the length of the eccentric rod, be eight times the travel of the valve, a usual proportion. Take $B\,E$ equal to $A\,C$, the throw of the eccentric, and from E as centre, and with radius equal to $A\,B$, describe an arc, cutting the circle in D and G. Let fall $D\,d$ perpendicular upon $C\,B$, and it will be seen that d is nearly coincident with C, from which it follows that the advance of the centre of the eccentric, measured on the line $C\,B$, is very nearly equal to the distance traveled by the valve-rod pin, or valve, from the commencement of its stroke, and if this be true for its position at half-stroke, it must be true for every other point, since the effect of the angularity is a maximum at half-stroke.

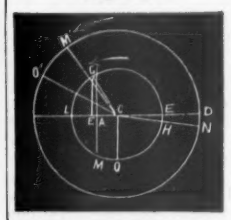
We can also very readily calculate the difference between the advance of the center of the eccentric or crank pin measured on the center line, and the actual distance traversed by the valve or piston from the commencement of its stroke. Thus in Fig. 13 (see last paper), $D\,g$ is the distance moved by the piston without correction for angularity, and $D\,n$ or x is the actual distance, therefore putting $D\,g = x^1$, we have correction $= D\,n - D\,g = x - x^1 = n\,g$; but $x = r\,(1 + n - \text{cos. } a - \sqrt{n^2 - \text{sin.}^2\,a})$; and $D\,g = D\,C - g\,C$; but $D\,C = r$ and $g\,C = r$ cos. a; therefore $x^1 = r\,(1 - \text{cos. } a)$, and reducing, we have $x - x^1 = r(n - \sqrt{n^2 - \text{sin.}^2\,a}) =$ correction; but from this formula we clearly see that, r and a remaining constant, $n\,g$ decreases as n increases; or, what is the same thing, as the length of connecting or eccentric rod increases, since the quantity $\sqrt{n^2 - \text{sin.}^2\,a}$ approximates to the value n as n increases. As an example, let us calculate the correction in the following case: $a = 45°$, $r = 4$ 3-16ths in., and $n = 16$ as above, here $n\,g = 4$ 3-16ths $(16 - \sqrt{16^2 - .5})$ or $n\,g = 4$ 3-16ths $\times .016 = 0.067$, or 1-16th in. nearly.

From this we see that the correction for angularity in the case of the eccentric rod may, in all ordinary cases, be neglected; should, however, it be necessary to take account of it in the case of extremely short eccentric rods, it may be done as above, by diagram or calculation.

We shall now proceed to consider the third question proposed, viz.: to find the position of the piston corresponding to that of the valve, and *vice versa*, at any point of the stroke. The relation between the crank and eccentric, and, therefore, between the piston and valve, is founded upon their uniform circular motion, since they are both fixed upon the same shaft, and consequently have the same angular motion. Before proceeding, however, we must explain that the travel or stroke of the valve, and, therefore, of the eccentric, when its rod is in direct communication with the valve-rod is in all cases equal to twice the outside lap, together with twice the width of port opened to steam because the distance moved by the valve past half-stroke before the port begins to open to steam is equal to the outside lap, and it has to move beyond this, to the amount the port is opened to steam; therefore, since the excursion of the valve is equal on each side of its position at half-stroke, the total travel must be twice that moved past half-stroke, or twice the sum of the lap and breadth of port opened to steam.

In Fig. 15 two concentric circles are drawn, the outside of which represents the path of the crank-pin to any scale, and the inside the path of the center of the eccentric to any scale. Let the horizontal diameter lie in the center line of the engine, and let $C\,D$ be the position of the crank at one of its dead points, when the piston is at the end of its stroke, and let the direction of the motion be indicated by the arrows; when the crank occupies this position the valve must have moved past half-stroke a distance equal to the sum of the lap and lead, since the lead has been explained to be the amount the port is opened to steam at the beginning of each stroke; if, therefore, we take $C\,E$ equal to the sum of the lap and lead to the same scale as the eccentric path, and erect a perpendicular from E to meet the small circle in G, $C\,G$ must be the position of the center line of the eccentric (neglecting the effect of the angularity of the eccentric rod) when the crank has the position of $C\,D$. Were there no lap nor lead, $G\,C$ would be at right angles to the crank $C\,D$, because, when the piston was beginning its stroke, the valve would be at half-stroke (see last paper); but when there are lap and lead, the angle between the center lines of the eccentric and crank is obtuse, and its excess over a right angle is called the "angular advance" of the eccentric, which may also obviously be defined to be the angle between the center lines of the eccentric when the valve is at half-stroke, and when the piston is beginning its stroke.

Fig. 15.



Scales ½" and ¾" to 1 ft.

Linear advance is the distance the valve has traveled past half stroke when the piston is just beginning its stroke, and is therefore equal to the sum of the lap and lead. From the above we see that when the eccentric rod is in immediate connection with the valve rod, the eccentric always *leads* the crank by an angle between 90° and 180°; the value of this angle is found as above by construction, or its exact value may be found as follows by calculation: Referring to Fig. 15, we have $C\,E$ = lap + lead = linear advance, the angle $C\,G\,E$ = angular advance, being the complement of $G\,C\,E$, and $G\,C$ = half travel of valve, since it is the radius of the circle described by the centre of the eccentric; therefore, since $\frac{E\,G}{C\,G} = \text{sin. } C\,G\,E$, we have $\frac{\text{linear advance}}{\text{half travel}} = \text{sine of angular advance}$. From this equation we can easily calculate the angular advance; for example, in the case of the valve we have been considering, we have lap = 1 13-16ths in. lead, say, 3-16ths in., and half travel, 4 3-16ths in., therefore, sine of angular advance $= \frac{1\ 13\text{-}16\text{ths} + 3\text{-}16\text{ths}}{4\ 3\text{-}16\text{ths}} = \frac{32}{67}$ or sine of required angle = .4776, or the angle is 28½° about.

This angle, then, added to 90°, or 118½°, is the angle by which the centre line of the eccentric leads the crank, Fig. 15, which is drawn to the scales of 1 in. to 1 ft., and 1½ in. to 1 ft. gives the same result. We should here remark that the lead is not, properly speaking, a dimension of the valve itself, it being fixed by the *posit on* only of the eccentric upon the shaft, and may accordingly be increased or diminished by shifting the eccentric round the shaft so as to bring its centre line further from, or nearer to, that of the crank.

It is usual, for the sake of clearness, to lay down the eccentric path, lap, lead, etc., to a larger scale than that for the crank orbit; this will, on a little consideration, be seen not to interfere with the correctness of the results, since the magnitude of the angle which the eccentric makes with the crank will not be altered by so doing, provided we have one fixed scale for all dimensions of the valve and another for the distances traversed by the piston.

We shall now proceed to find the relative position of the valve and piston for the four principal events, of admission, cut-off, release and compression. Returning to Fig. 15, take $C\,A$, equal to the lap of the valve; from A erect a perpendicular $A\,K$ to $E\,D$, then K is the position of the eccentric center when the valve has traveled a distance past half-stroke equal to the lap; but since the eccentric is in advance of the crank in every position by the angular advance, plus 90°, we have only to describe an arc, with K as center and radius equal to the chord of $G\,B$, cutting the eccentric path in H, then the point N, in which $C\,H$ produced cuts the crank orbit, is the position of the crank pin when admission takes place. When the valve gives the greatest opening to steam, it must be at the extremity of its travel, therefore $L\,C$ is the position of the eccentric. Following the motion round, the eccentric center will have traveled back to M when the cut-off takes place, and we obtain the corresponding position, M^1, of the crank-pin as before. If there be neither lap nor clearance, release on one side and compression on the other side of the piston take place simultaneously when the valve reaches half-stroke, or when the eccentric takes the position, $e\,o$. The corresponding position of the crank pin is shown at o^1. If there be inside lap the position of the eccentric center when release takes place will be past half-stroke by the amount of the inside lap, and when compression takes place, it will be short of half-stroke by the same amount. If the valve have clearance the reverse will be the case. In fact, when no account is taken of the angularity of the eccentric rod, the projection of any position of the valve, taken upon the line $L\,B$, upon the circle of the eccentric's path, will give the corresponding position of the center of the eccentric, and the corresponding position of the crank pin is found as above. Also, the several positions of the piston corresponding to those of the crank pin may be found by the methods given in the last paper, or, if the angularity of the connecting-rod may be neglected, in the case of long one, the points in which perpendiculars from the several points of the crank pin meet the horizontal diameter will give the distances traversed by the piston from the beginning of its stroke. In our next paper we shall give these distances as obtained by scale from a diagram similar to Fig. 15, and also explain how the same distances may be obtained by calculation.

MASTER CAR-BUILDERS' ASSOCIATION.

Proceedings of the Fifth Annual Convention, in Richmond, Last Week.

The convention of Master Car Builders met this year on Wednesday, the 14th of June, at the Exchange Hotel in Richmond, Va.

The meeting was called to order by the President, F. D. Adams, of the Boston & Albany Railroad, and Mr. Hugh Gray, the Vice-President, being absent, Mr. J. W. Van Houton, of the Pennsylvania Railroad, was elected Vice-President *pro tem.*, after which an

INTRODUCTORY ADDRESS

was made by General Robert Ransom, of North Carolina, in which he expressed his wish that the session of the Central Association might be harmonious, and disclaiming any intention of usurping the right to welcome the members to Richmond, introduced Mayor Keiley, who, in an appropriate and eloquent speech, greeted them as follows:

Mr. President and Gentlemen: If I consulted simply my own convenience I would content myself this morning with merely welcoming you, with great cordiality, to our city, and congratulating you on the successful and peaceful manner in which you have accomplished your movement, "On to Richmond."

But in this, the first national convention of a body of mechanics which, perhaps, ever assembled in the capital of Virginia, there is, in my judgment, a significance which merits a word of notice. The most inattentive observer of current events must perceive that we are on the margin of a great wave of progress in the social and industrial world. The practical men of the earth, the miracle-workers of to-day, that wise and brave and powerful body of men, who, out of the grime and sweat of the workshops, are framing those prodigies of modern art which surpass the fabled achievements of the Titans, and before the practical utility of whose labors the grandest monuments of ancient workmen seem but toys—those grim brothers of steam and fire and electricity, who are piercing the eternal Alps and mingling the far-severed seas, and wedding remotest continents, and charming time and space out of the category of men, are coming forward in many lands asserting their claim to full recognition among their fellows, and demanding, as they have an unquestionable right to demand, their full participation in the beneficent results of their wise planning and their patient toil.

Dimly, perhaps, in the present, but clearly and definitely in the future, will they discern the measure of what is due them, and prudently and justly and legally will they contend for it and obtain it.

Employers are beginning to learn that tariffs and taxes are too often framed to ignore, if not to oppress them. That laws are passed by those whose ignorance of their wants is as fatal to their property as downright hostility would be. The employed are beginning to learn that when they are not *fairly* paid the deficit in the just returns of many goes to swell the already bursting coffers of one. They are beginning to learn that when they are not *promptly* paid, the wages thus unjustly withheld is simply so much capital lent by the poor workman to the rich company, oftentimes lent for a long period, and *always without interest*. They are beginning to learn that when business is brisk *they* rarely get the benefit, whereas when it is dull, they have always to suffer. They are beginning to learn that the maxims of political economy, as capital has written them, are a heartless code, out of which charity and humanity has been eliminated in order that avarice might be as philosophical as it is profitable.

And lastly, all are learning, as this respectable and intelligent body, representing a particular field of labor, demonstrates, that for the bettering of their condition, whether as employers or employed, the first step is honest, open, public co operation.

For these reasons I feel that I speak the sentiment of this entire community when I bid you God speed in your labors, and invoke for you the wisdom and temperateness of counsel, out of which can come solid and permanent benefit to your craft.

May I be allowed to add, gentlemen, that I hail this gathering with pleasure on this further account, that it is one more link binding together our disrupted people and preparing them fully to realize that in the matchless destiny of our common country we should all have pride as we shall all have part. It is impossible for people to come near to each other, by whatever agencies drawn, and maintain bitter animosities—least of all where they are drawn by so many ties of common ancestry, language, history and renown.

Let us hope that the powerful aid of the workingmen of the land may be lent to bury our differences out of our sight, speeding the advent of that better day when, as of old, we shall all feel an interest and a pride in the prosperity, happiness and freedom of a common country.

At the close of Mayor Keiley's address, three cheers were proposed and given for Richmond and Mayor Keiley.

SPEECH OF THE PRESIDENT.

The President, Mr. F. D. Adams, replying on behalf of the Association, said:

Our object in selecting Richmond as the place for holding our meeting this year was chiefly in order that we might meet and become acquainted with the gentlemen who occupy similar positions on Southern railroads to those which most of us fill at the North. We desired to exchange friendly greeting and information with them; to compare our experience with theirs, and thus facilitate intercourse between all parts of the country, and join hands, even though it might be only to grasp an iron rail at opposite ends of a line extending from Maine to Texas.

It is, perhaps, not necessary for me to say that we are all

more accustomed to *do* things than to talk of them, and know more about handling two-foot rules than of using the rules of grammar and rhetoric; and knowing the danger which persons more accustomed to framing cars than of framing sentences incur when speaking extemporaneously, I have taken the precaution of preparing a written address.

In doing so, it has occurred to me that as many of our members present having joined our Association since its organization they may not be acquainted with its origin, and that it might not be uninteresting to them at least to hear how it began. I will, therefore, give a brief outline of the circumstances that brought us into the present organization called the *Master Car-Builders' Association of the United States.* All of us can remember when cars were confined almost, if not entirely, to the roads for which they were built and to which they belonged. The inconvenience of transshipping freight when carried long distances soon made it necessary to run cars over more roads than one, and as the demand for carrying freight further without breaking bulk increased, some improvement was necessary in order to carry it without unloading, and as rapidly as possible. This brought into existence the different express-line cars, which now form so large a part of our equipment. The *Red Line* was among the first which was organized. In the beginning, running only from Boston and New York to Chicago, it now carries freight through from the Atlantic to the Pacific, and has, to some extent at least, reversed the current of trade with China and Japan.

It was soon found that difficulties were constantly occurring in regard to the repairs of these cars, and that they were often delayed when far from home by not having the right kind of material on hand to replace broken parts. Consequently some plan had to be devised to obviate this evil.

The question then came up, who can help us out of this difficulty? The well-known and successful manager at that time of the Red Line was Mr. Otis Kimball, and he at once suggested to the superintendents of the different roads comprising the line that they should have a meeting with their *car-masters* at his office, in Buffalo, and consult about a plan for repairs on the line cars. They met and agreed upon some arrangements and rules by which those who met there should all be governed in reference to the repairs of these cars. This meeting adjourned to meet again in New York, then again in Albany, and next again in Adrian, Mich., these meetings covering about eighteen months' time. They had thus far been attended only by those immediately connected with the Red Line. While we were together at Adrian we were visited by a delegation from the Pennsylvania Central Railroad, they having learned something of our meeting at different times, and probably having some curiosity to know what we could find to do or talk about. They came there and took some part in the discussions. It then occurred to our former President (Mr. J. W. Van Houton)—and it is to him that the Master Car Builders' Association owes its existence—and he then suggested that before the meeting adjourn the Chairman (Mr. John Kirby) should be instructed to call a meeting of all the railway master car-builders of the United States, to meet at Springfield, Mass., in June, 1867, for the purpose of organizing a national association.

This is a brief history of our starting point. Since that time we have grown to what we are now in this, our fifth annual meeting. Our association, comprising as it does a large majority of the master car-builders of the land, must exercise an influence on the means and facilities of railroad travel, if we only strive each of us to contribute to our meetings some portion of our knowledge and experience. Coming, as we do, from every portion of the land, an interchange of ideas can hardly do otherwise than increase our knowledge and exercise an important influence upon the economy, comfort and safety of the vehicles of railroad travel. For every improvement in this direction, and for every remedy of existing evils, the public looks to us.

We have met here to interchange views, suggest improvements and entertain new ideas, if any such should be presented for our consideration.

Those of you who were present in New York at our last convention, I have no doubt recollect that various committees were then appointed to investigate and report upon different subjects at this meeting. I expect those committees are here with all the information they could obtain in regard to the subjects referred to them, and in due time we expect to hear their reports.

All can see, at a glance, that although none of us may be well educated in science, nevertheless we may claim to be experimental and practical mechanics, and should not allow an opportunity to escape when we can, by careful attention, add to our stock of information and experience. I desire to urge upon all to improve every opportunity to collect information and bring it to the annual meeting for our mutual benefit and that of the companies with which we are connected. The meetings will thus reflect credit upon ourselves and accomplish the object of our annual gathering.

I will also say, at this time, that some of the articles in our constitution seem to require amendment, as they conflict in some degree with the objects of our association. I refer especially to Articles 14 and 15, which require some change, and some others might be amended to advantage.

It is my painful duty, at this time, to announce to you that during the past year our ranks have been broken by the death of Mr. N. H. Marsh, of the Atlantic & Great Western Railroad, and Mr. Samuel Frost, of the Georgia Railroad. The first was one of our earliest members, and esteemed by all of us who enjoyed his friendship or acquaintance. The latter met with us in New York for the first and last time on earth. Even by the short acquaintance of that single meeting he won the esteem and commanded the respect of all who then met him. I trust that a committee will be appointed to present suitable resolutions with reference to the death of these members.

In conclusion, let me acknowledge the goodness of the Great Ruler of all, in permitting so many of us to meet together in health, strength and prosperity; and I feel that I must add that I most earnestly hope we shall not allow ourselves to lose sight of the objects that have called us together by the kind courtesies of our friends around us.

PROCEEDING TO BUSINESS.

After the speech of the President, the Secretary, Mr. Leander Garey, of the New York & Harlem Railroad, called the roll. The following members answered to their names:

W. E. Chamberlain, Boston & Albany.
D. C. Richardson, Boston & Maine.
L. A. Davis, Boston & Lowell.
J. N. Milcham, Buffalo & Erie.
Chas. Pratt, Boston, Hartford & Erie.
E. Lockwood, Camden & Amboy.
William Campbell, Chicago & Northwestern.
Wm. F. Smith, Cleveland, Columbus, Cincinnati & Indianapolis.
M. W. Dickerman, Concord.
A. Langmaid, Concord & Claremont.
C. C. Millar, Central of Georgia.
George Hackett, Central of New Jersey.
J. P. Somerby, Eastern.
Samuel Reeves, East Pennsylvania.
C. A. Smith, Erie.
Samuel Stevens, Fitchburg & Worcester.
V. D. Perry, Hartford, Providence & Fishkill.
J. L. Hackenthorn, Kentucky Central.
M. P. Ford, Little Miami, Columbus & Xenia.
Theo. G. Shaw, Louisville, Cincinnati & Lexington.
M. W. Dickerman, Manchester & Lawrence.
W. H. Daniels, Montgomery & West Point.
A. J. Nix, Mobile & Girard.
Henry Fox, New Haven & Northampton.
Leander Garey, New York & Harlem.
Joseph Jones, New York Central.
Wm. Johnson, New York Central.
M. E. Andrews, New York & New Haven.
Geo. Boyden, New London & Northern.
David H. Baker, New Jersey Transportation Company.
George W. Gray, Naugatuck.
B. G. Sergeant, North Carolina.
Albert Langmaid, Northern.
G. R. Bentley, Norwich & Worcester.
J. W. Van Houten, Pennsylvania.
Samuel W. Myers, Pennsylvania.
John P. Levan, Pennsylvania.
R. S. Ramsey, Pennsylvania.
John Quigley, Philadelphia & Erie.
Aaron Steinbach, Philadelphia & Reading.
Theo. Chamberlain, Pittsburgh, Cincinnati & St. Louis.
James McGee, Pittsburgh, Cincinnati & St. Louis.
John Marquis, Pittsburgh, Fort Wayne & Chicago.
Samuel Dean, Portland & Rochester.
J. W. Trussel, Portland & Kennebec.
Alex. Wright, Petersburg.
Olney L. Smith, Providence & Worcester.
M. Wilder, Rochester & Genesee.
W. H. Dunham, Southern Minnesota.
H. Kirmse, Terre Haute & Indianapolis.
C. C. Williams, West Jersey.
J. H. Nusscar, Western Marvland.
John Sherman, Western & Atlantic.

The proceedings of the last meeting were then read and approved, and the Chair announced a recess of ten minutes to allow parties desirous of connecting themselves with the Association to become members. The following names were added to the roll:

H. Longest, Richmond & Danville.
J. H. F. Wiers, Atlantic & Great Western.
W. J. Calais, Wilmington, Columbia & Augusta.
H. A. Webster, New Jersey Southern.
A. Steinbrunner, Cleveland & Pittsburgh.
Willis Davis, Empire Transportation Company.
Osgood Bradley, Jr., Worcester, Mass.
G. E. Stevens, Union Pacific.
C. E. Garey, New York & Harlem.
N. B. Phelps, New York & Harlem.
Samuel Campbell, of Jackson & Sharp's, Wilmington, Del.
W. E. Granger, Boston & Albany.
Howard Fry, Grand Trunk.
Wm. A Morgan, Atlantic, Mississippi & Ohio.
W. B. Wilkins, Junction Car Works, Philadelphia.
J. W. Fleming, Tredegar Works, Richmond.
E. A. Olmstead, Long Island Railroad.
— Chiles, Great Western of Canada.

PRIVILEGED QUESTION.

Mr. Johnson, of Buffalo, objected to a supposed intimation in the President's report that the Association was originated by other persons than master car builders. This was a mistake, and he hoped it would not go forth thus to the world.

No action was taken on this suggestion.

TREASURER'S REPORT.

The Secretary then read the report of Mr. A. Steinbach, Treasurer, with accompanying documents. It makes the following exhibit:

Receipts for assessements	$144 00
Copeland fund	55 00
Total receipts	$199 00
Cash paid as per vouchers	172 78
Balance	$26 22

The accompanying documents consisted of a correspondence between the Treasurer of the Association and Wm. Toothe, Treasurer of the New York Committee of Arrangements, under whose auspices a banquet was given the Association in New York last year. It seems that after all the bills for the banquet had been paid, there was a surplus of $573.73, which amount was turned over to the Treasurer for such charitable use as the Association might choose to apply it. The Treasurer accepted the donation, and holds it subject to the order of the Association.

The report was adopted, and the correspondence referred to a committee on resolutions and communications hereafter to be appointed.

COMMITTEE ON RESOLUTIONS.

The President appointed the following Committee on Resolutions and Communications: Jos. Jones, of the New York Central; W. E. Chamberlain, of the Boston & Albany; W. C. Andrews, of the New York & New Haven; J. N. Mileham, of the Michigan Southern, and J. P. Levan, of the Pennsylvania Central Railroad.

REVISED CONSTITUTION AND BY-LAWS.

Messrs. M. C. Andrews, L. Garey and R. L. Ramsey, the committee appointed to revise the constitution and by-laws, made a report, which was adopted.

The revised constitution changes the name of the Association to the "United American Railway Master Car-Builders' Association." The objects of the Association are to enable members to interchange opinions in regard to the best mode of constructing railway cars, etc. Master car-builders, foremen of shops, and one representative from each car manufacturing establishment constitutes its membership, they being required to sign the constitution or authorize the President or Secretary to do so for them. Each member is to pay his assessment under forfeiture of membership. The officers are a President, Vice-President, Secretary and Treasurer, elected, separately, by ballot, for twelve months or until their successors are elected. The duties of the officers are prescribed, and do not differ from those assigned to similar officers in like associations. The regular meetings of the Association are held on the second Wednesday in June, at such point as shall be decided by a majority vote of the previous annual meeting. The regular hours of the session are from 9 a. m. to 2 p. m. daily.

Section 1 of article 6 reads as follows:

"No question or discussions as to the regulation of the amount to be paid by the day, week, or month, or the number of hours that shall constitute a day's work, shall be allowed at the meeting of the Association."

Section 2 of the same article is as follows:

"No patentees, or their agents, shall be admitted in the meeting of the Association for the purpose of advocating the claims of any patent or patentee."

The constitution may be amended at any annual meeting by a two-thirds vote of those present.

ORDER OF BUSINESS.

1. Calling the roll. 2. Reading the minutes of last meeting. 3. Address of the President. 4. Reports of committees. 5. Unfinished business. 6. New business. 7. Miscellaneous business. 8. Election of officers. 9. Adjournment.

CAR-BUILDERS' DICTIONARY.

Messrs. James McGee and M. C. Andrews, from the committee appointed to prepare a directory, so as to establish a uniformity in the names of articles used by car-builders and railroad men, reported that, owing to the distance the members of the committee resided from each other, they had been unable to perform the duty assigned them.

On motion of Mr. Calis, the committee was discharged.

Mr. Somerby thought a new committee ought to be appointed.

REPORT OF THE COMMITTEE ON SCREW-THREADS AND NUTS.

Messrs. Perry, Hackett and Hitchcock, from the above named committee, made an interesting report, which was adopted.

The committee recommend the standard proposed in an essay on a system of screw threads and nuts by Mr. William Sellers, of Philadelphia, and reported by a special committee appointed by the Franklin Institute of Pennsylvania, and adopted by our government.

In conclusion, they offered the following resolution, which, with the report, was adopted:

"*Resolved*, That the Master Car-Builders' Association have the proposed system printed on cards and presented to car-masters and car manufacturing companies, requesting them to use their influence to promote the adoption of a uniform system of screw-threads, bolt-heads and nuts."

LINKS AND PINS.

The chairman of this committee being absent, and Mr. Lockwood being excused, Mr. Johnson, of Buffalo, the remaining member, read a paper as his own views on the subject, which recommended that the couplings should be made of the very best iron, and be oval in shape. This, he said, gives them superior strength. Pins should be made of steel, and should be flat, with rounded edges.

Mr. Myers thought the report satisfactory as far as it went, but it failed in an essential particular, in not saying anything about the size.

Mr. Johnson, in reply, remarked that this is a matter upon which car builders will continue to differ. He added that the reason he did not specify the kind of iron to be used was because there is no uniformity in the quality of that turned out by any particular firm. He therefore contented himself with recommending the best iron that could be had.

On motion of Mr. Ramsey, the report was recommitted, and the general understanding was, that a further report will be made to-day at 12 m. Mr. Johnson being excused from further service on this committee, Messrs. Ramsey and Levan, of the Pennsylvania Central, were appointed on it.

VENTILATION.

Mr. Ford, from the Committee on Ventilation of Cars, said his associates were not present, but asked the privilege of giving his own views.

The Secretary stated that he had received a letter from Mr. Kirby, the Chairman of the Committee, who expected to be present before the Association adjourned.

The subject was, therefore, passed by for the present; and the same action was taken in reference to the Committee on Painting.

BRAKES.

Mr. Ramsey, from the committee on the best method of hanging brakes and placing them under the control of the engineer, asked that, in view of the inventions now being tried, the committee be continued.

Mr. C. A. Smith, of the Erie Railway, asked that the Committee on Wheels and Axles be also continued, and the request was granted.

SPRINGS.

The committee appointed to ascertain the best and most economical form for journal and center-motion springs for passenger and freight cars, presented a report recommending the elliptic form for passenger-car body-springs, as, when manufactured from good cast-steel and properly adjusted to the weight of cars, durable, and securing easy motion. The best action of the elliptic spring is secured when the distance between the bands in the center of the spring do not exceed four inches. The high or arched form (after the weight of the car is applied) should be avoided in all cases where an easy and agreeable motion is required. The committee do not recommend any particular form of spring for general use as a journal spring. The journal spring should not be placed directly over the journal, but on a yoke, or equalizing bar, to secure the best results as to life of spring and ease of motion.

Mr. Miller, of the Georgia Central, differed with the committee, and said his experience had brought him to a different conclusion.

Mr. Steinbach, of the Philadelphia & Reading, thought a comparison of views on the subject would not be decisive.

Mr. Garey, of the New York & Harlem, thought there was no subject of more interest to the traveling public, and he hoped it would be well considered.

Mr. Ramsey, of the Pennsylvania Central, was favorable to the elliptic spring.

Mr. Jones, of the New York Central, agreed entirely with the committee.

Mr. Varney, of the Fitchburg Railroad, spoke to the same effect.

The report was then adopted.

ASSESSMENT.

Messrs. J. G. Somerby, of the Eastern Railroad; A. Steinbach, of the Reading Railroad, and J. McGee, of the Pittsburgh, Cincinnati & St. Lous, were appointed a Committee on Assessments.

The Association then adjourned until next morning at 9 o'clock.

SECOND DAY'S PROCEEDINGS.

The Convention was called to order by the President at a quarter to 10 o'clock. The reading of the minutes of the previous meeting was dispensed with by a vote of the Convention. The reports of the committees were then called for.

COMMITTEE ON PAINTING.

The committee stated that they had addressed 250 circulars to members of the Association, requesting information on points connected with the subject of painting, submitting questions as to the mixing of paints, the best method of removing old paint, the causes of the cracking of paint, the average life of varnish, etc. To some of these answers had been received, which were read. The report was adopted.

COMMITTEE ON VENTILATION.

Mr. Ford being the only member of the committee present, submitted some thoughts in writing on the importance of ventilation, in substance as follows: A constant supply in proper quantities in warm weather of cool and fresh air and of pure air heated to a proper temperature is what is needed to secure good ventilation, but to get these has been one of the most difficult things to accomplish in connection with car building. It is quite a different thing to heat and ventilate a room. The car is at one moment standing still, then rushing along at the rate of thirty miles an hour, with the door constantly thrown open by the passing in and out by conductors, brakesmen and passengers. A great many devices have been tried, and Mr. Ford suggested the plan known as the Foote ventilation, taking its name from the inventor, stating that everything claimed for the invention was accomplished by it. In the warmest and dryest season, passengers riding in a car with this apparatus attached come out entirely free from dust and much less fatigued than those in a car where the apparatus is not used. The plan is to attach to the side of the car a water tank, holding three barrels of water. The air is caught on the top of the car, carried down an air passage on each side of the car on the inside, and passes through a spray caused by forcing water through a finely perforated pipe, by means of a centrifugal pump driven from one of the axles by means of a belt. The windows were arranged so as to prevent their being opened more than two or three inches. In cold weather the tank was supplied with a stove and the heated air passed through the same grating. This arrangement did not work as well for warming as the summer one for ventilating. The objection to the plan was the expense. Mr. Ford went on to state that the condition of the air surrounding the coach must be taken into consideration. The air to be introduced into the car must be cleansed of the disagreeable elements and impurities. Mr. Ford suggested Baker's patent heater as the best apparatus for warming.

Mr. Ward, from the Pennsylvania Central Railroad, thought the Baker patent about the best he had seen.

Mr. Fry, from the Canada Grand Trunk Railroad, stated that though he had not yet become a member of the Association, he felt a very great interest in the subject of car-heating and ventilation. He desired to know whether or not the pipes which conducted the warm water were not liable to become filled with sediment from the water of various districts, and also if the Baker or other patents of a similar character did not crack and disfigure the paint of the cars from the intense heat.

Mr. Lockwood, from the Camden & Amboy Railroad, spoke at some length of a mode of heating by coal or wood stoves, which were used in the cars on his road. These stoves made a pleasant heat, and fresh air was introduced from the top by means of a register at the top of the car.

Mr. Chiles, from the Great Western Railroad of Canada, thought that the Baker heater was the best that he had seen, but it seemed to him that it was difficult to secure good ventitation with these heaters.

Mr. Smith, of the Erie, thought the Baker the best heater, but there is no ventilation with it. In connection with this he had used a ventilator designed by Mr. Garey, the Secretary of the Convention, which worked admirably. This contrivance admits the air over the front platform, and discharges it at an opposite point in the rear. It is simple and easily managed and kept in order. In reply to a remark from Mr. Baker, who thought time was being unnecessarily consumed in referring to this or that patent, Mr. Smith said that if we discard all patents we will return to the ignorance of past days, and throw away all that is valuable in car-building.

Mr. Garey thought that if there is merit in a patent it ought to be discussed here. He would like to hear all discussed. In this way railroads could be saved vast amounts.

Mr. Chamberlain, of the Boston & Albany, said his roads are trying all, and he thought that a swinging sash covered with gauze operated about as well as any, and it is not patented.

Mr. Baker, of the New Jersey Transportation, had used the same and thought well of it.

Mr. Andrews said that on the New York & New Haven they exhaust the air from the cars by opening the dome-sash. The air is supplied, not from the top, but by side ventilators in the body of the car. He didn't know but that the plan for admitting it through the ends, as described by gentlemen who had preceded him, would answer better.

On motion of Mr. Van Houten, Messrs. Andrews and Levan were appointed on the committee in place of the absentees, with Mr. Ford as chairman.

On motion of Mr. Baker, the committee was allowed until the next annual meeting to make their report.

COMMITTEE ON DEAD WEIGHTS.

Mr. J. M. Mileham, of the Buffalo & Erie Railroad, was the only member of the committee present, and a motion being made and carried to appoint two others to confer with him, the Chair appointed Messrs. Chamberlain and McGee to confer with him, and after retiring returned with their report, from which we condense the substance, as follows:

To reduce the weight of cars will lower the cost of transportation in proportion to the reduction of weight made. First, in relation to passenger cars: years ago a car forty feet long was considered a large car, and was made much lighter than the cars now in use, for the reason that we did not then run such heavy trains, nor were they drawn by as heavy locomotives; consequently the concussion was not so great as at the present time; but the experience of late years teaches us that with the heavy additions of various kinds, such as ventilation, heating arrangements, extra heavy platforms, and, on most roads, heavy brake-rigging, and, in fact, every thing increased in weight, and the cars lengthened to 50, 55 and 60 feet, to meet all the extra weight must necessarily increase the strength of the body of the car or be deficient of strength in the center of the car. The increased weight of the passenger car is in proportion to its increased carrying capacity.

The old style of coach was built to accommodate forty-eight passengers, and weighed about fourteen tons, and consequently there were carried little over three passengers to a ton. Now, to meet the demands of the increased passenger traffic on our roads, the carrying capacity of coaches was increased to sixty-six passengers, increasing the weight to eighteen tons, preserving the same proportion of passengers to a ton. The passenger cars are not too strong for safety and durability, and the cars cannot be lightened without weakening them in proportion. In regard to freight cars: they can be made much lighter than they are. Ten tons should be the standard, if that can be made the standard weight of load for cars to carry. No regular loading weight has been given. All that can be placed on a car is put on, with no regard to the strength of the car. Platform cars carry heavy material, which requires the use of a crane to handle, and often, when loading with stones, they are allowed to fall heavily on the floor of the car. Freight cars carry more, and are put to a severer test than heretofore. Motive power is heavier and trains are longer. Some standard height of draw-heads should be determined on. On account of overloading and the severe tests to which they are put, some addition is made to the weight. The committee are not prepared to recommend building cars lighter, so long as there is this demand for heavy engines, heavy trains and heavy loads.

After the reading of the report, a discussion arose as to remedying the evil complained of in the report, and each member was asked to give his experience and views on the subject.

Mr. Smith, of the Erie, stated that although his road was a wide guage, they were making passenger cars lighter than roads of narrower gauge.

On a suggestion being made that the discussion should be discontinued, and the business proceeded with, Mr. Garey, of the New York & Harlem Railroad, objected to the discussion being cut short; that they were there for an interchange of ideas, and that he knew thirty or forty members who came more from interest in this subject than in any other.

Mr. Lockwood, of the Camden & Amboy Railroad, stated that the cars on his road weighed 32,500 pounds, and carried sixty-two passengers, and that the cars were often filled beyond their strength and durability.

Mr. Smith, of the Erie, suggested that each road build a trial freight car, and make report of the weight and cost of building at the next meeting of the Convention.

Mr. Fry, of the Grand Trunk, Canada, advocated the suggestion of Mr. Smith, and moved that the Convention pass a resolution requesting the managers of roads to allow a car to be built in order that a report may be made.

Mr. Garey moved that the height of draw-bars from the top of the track to the center of draw-bars be three feet. Motion was afterwards withdrawn.

COMMITTEE ON PLATFORMS AND COUPLINGS.

This committee recommended the adoption by the different roads of some standard for the height from the track to the top of the platform, and the shortening of the coupling, in order to avoid one car riding the platform of another. The nearer the platform is to the line of the car, the stronger it would be, and better able to resist the strain or shock of sudden stoppage. In coupling the cars, would recommend that they be fastened close together, with as little play in the coupling as possible. This does away with a great deal of the shock occasioned by the starting of a train. The couplings are less liable to break, and the danger in passing from one car to another is lessened. The adoption of safety chains is recommended, as in case of the coupling breaking, delay and accident may be prevented. The committee consisted of D. Baker, New Jersey Railroad & Transportation Company, and R. Allridge, Cleveland, Columbus, Cincinnati & Indianapolis Railroad. Report adopted.

COMMITTEE ON LINKS AND PINS.

The committee reported that they had not sufficient length of time to investigate. He commended draw-heads now in use on the freight and passenger cars of the Pennsylvania Railroad as being the best for preventing the loss of links and pins.

On motion of Mr. Garey, the report was laid on the table.

R. S. Ramsey, Pennsylvania Railroad, J. R. Levan, Pennsylvania Railroad, committee.

COMMITTEE ON ASSESSMENT.

This committee recommended an assessment of $3 a member to defray the expenses of the meeting. J. B. Somerby, Eastern Railroad; A. Steinbach, Philadelphia & Reading Railroad, and James McGee, Pittsburgh, Cincinnati & St. Louis Railroad, committee. Report adopted.

COMMITTEE ON OIL-BOXES AND JOURNAL-BEARINGS.

Mr. J. B. Somerby, of the Eastern Railroad, being the only member present, the time of making the report was extended until next meeting.

UNFINISHED BUSINESS.

The report of the Committee on Car Roofs being laid over until next meeting, the Convention proceeded to take up the unfinished business.

On motion of Mr. M. C. Andrews, of the New York & New Haven Railroad, it was resolved that the Convention accept the generous offer of the donors of the banquet in New York, made through their Treasurer, in their communication of January 30th.

COPELAND MONUMENT.

A letter from Mr. Reuben Wells was read, giving an account of the monument erected to the memory of Charles H. Copeland in Chestnut Grove Cemetery, in Jeffersonville, Ind.

The thanks of the Convention were returned to Mr. Wells.

HEIGHT OF DRAW-HEADS.

A discussion arose as to the standard height of draw-heads, during which the President vacated the chair to address the meeting. Before any action was taken the Convention adjourned until seven o'clock in the evening.

COLLATION AT THE TREDEGAR WORKS.

In the afternoon of Wednesday, after adjournment, the members of the Association were taken to the famous Tredegar Iron Works, where they were shown over the works and most hospitably treated. President Adams responded to these courtesies in a neat speech, and proposed three cheers for the Tredegar Works. Speeches were made by General Robert Ransom, of North Carolina; General Boulson, of New York, Colonel Archer Anderson, of the Tredegar Company; Colonel Owens, and, in response to a toast to the Mayor, by Mr. John S. Wise. A toast to the press of Richmond was responded to by Col. W. S. Gilman, of the *Enquirer*. Three cheers for Richmond were given, and after some other short addresses the company dispersed.

EVENING SESSION.

The meeting was called to order about half-past seven o'clock. Before the discussion on height of draw-heads was resumed, the Chair appointed Messrs. Chamberlain, Ramsey and Somerby a committee to nominate officers, and Messrs. Richardson, Gleason and Miller a committee to present a place to hold the next meeting.

HEIGHT OF DRAW-HEADS.

A lively debate arose when the subject of "draw-heads" was re-introduced, and various resolutions were passed and afterwards reconsidered. The standard height, as at last agreed on, was two feet, nine inches.

SUNDRY RESOLUTIONS.

A vote of thanks was passed to all the roads over which the members were passed free.

The following resolutions were offered by Mr. Garey:

Resolved, That a committee be appointed with power to publish an illustrated book defining the proper terms or names of each and every part used in the construction of railway cars, and description of the use of the same.

Resolved, That the present officers of this Association be associated with the committee aforesaid.

The resolutions were adopted.

PASSES TO WASHINGTON.

Mr. Adams read a communication from Mr. R. V. Daniel, President of the Richmond, Fredericksburg & Potomac Railroad Company, offering to pass the delegates free to Washington. [Applause].

On motion of Mr. Adams, the thanks of the Convention were voted to Mr. Daniel.

Mr. Van Houten offered a resolution appropriating $70 for the erection of a suitable monument of stone at the grave of our late brother member, J. R. Chiles, whose remains are buried at Richmond. Adopted.

STATISTICAL REPORTS.

The Secretary offered a resolution providing for securing annual reports of the number of cars of all kinds built in the United States.

RESOLUTIONS OF THANKS.

Mr. Van Houten offered a preamble and resolutions conveying the thanks of the Association to Mayor Kelley, members of the Council and citizens generally, for their kindness and hospitality; to General Anderson and others of the Tredegar Iron Works for the invitation to visit and inspect the works, and for the handsome entertainment furnished while there; to the proprietors of the Exchange Hotel, and reporters of the press. The preamble declares that "we have found "it this city the same warm greeting and fraternal "feeling as we have met in every other city in which "we have assembled," and the last resolution declares that "our visit to Richmond is one of real pleasure and "satisfaction." The preamble and resolutions were unanimously adopted.

PLACE OF NEXT MEETING.

The committee to select the place for the next meeting of the association reported in favor of Boston.

Mr. Sharsa moved to substitute St. Louis. After some debate the amendment was agreed to, and the report adopted.

ELECTION OF OFFICERS.

The Association then proceeded to the election of officers with the following results:

President—M. C. Andrews, of the New York & New Haven Railroad.

Vice-President—M. C. Ford, of the Little Miami Railroad.

Secretary—Leander Garey, of the New York & Harlem Railroad.

Treasurer—A. Steinbach, of the Philadelphia & Reading Railroad.

RICHMOND TRADES' UNION.

A communication was read from the Richmond Trades' Union expressing the accord of that body with this Association, and inviting the latter to a fraternal meeting at the rooms of the Union Saturday evening.

It was ordered that the Secretary inform the Union of the appreciation of their kindly sentiments, etc., after which, on motion, the Association adjourned until June, 1872.